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TREATISE

ON

THERAPEUTICS

TRANSLATED BY D. F. LINCOLN, M.D., FROM FRENCH OF

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Professor of Therapeutics in the Faculty of Medicine of Paris; Physician to the Hôtel Dieu; Member of the Academy of Medicine; Commander of the Legion of Honor; Ex-representative of the People in the Constituent Assembly, etc.

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THERAPEUTICS.

CHAPTER I.

RECONSTITUENT REMEDIES.

IRON.

Chlorosis.

IN order to form a just idea of the action of the ferruginous drugs, it is necessary to consider the disturbances produced in the system by modifications in the crasis of the blood.

A number of disturbances occur after a full bleeding, no doubt owing to the fact that the organs no longer receive an amount sufficient for the discharge of their functions. In proportion as the loss of blood is repaired, these disturbances cease. But, if the bleedings are repeated so often that the blood cannot be renewed, if the supply of nutriment is not sufficiently rich to furnish materials for such renovation, or if a malady, unknown in its essence but very common, blanches the blood to an extent even greater than the most abundant bleeding will cause, a condition of the system supervenes which is known in women by the name of chlorosis, and in men is termed anæmia.

Chlorosis is almost always spontaneous. Anæmia is almost always secondary.

It is not easy to say why chlorosis is the almost exclusive property of women; but every one knows that it is extremely rare to find a young man chlorotic.

It has been supposed that this fact might be explained by the difference between the composition of the blood in the two sexes. Analysis proves that, in general, the blood of a healthy woman contains a little less of the globules than that of a man in good health. But, admitting that this difference is not without some influence, it is more rational to suppose that the real cause of this remarkable pathological fact resides in conditions inherent in the sex.

The analysis of MM. Andral and Gavarret demonstrate that in 1,000 grammes of normal blood we find, on an average, 127 grammes of blood-

globules; while in the case of chlorotic persons the amount may fall to 38, the quantity of fibrin remaining nearly the same as in women in health.

These analyses account for the pallor and the liquidity of the blood of chlorotic patients, and perhaps for the greater part of the singular symptoms of which they complain. One can see how the blood, robbed of a part of its stimulant principles, ceases to be fit to modify the organs, and that numerous functional troubles are the result.

The muscles of animal life lose color, become atrophied and relaxed; hence arises difficulty and slowness of motion. The muscles of organic life share in the same changes; hence, flaccidity of the heart, difficult circulation, sluggishness of the stomach, constipation, flatulence. Finally, the blood which reaches the nervous centres, the glands, and the membranes, no longer possessing its natural qualities, these organs can no longer exercise their functions as in their natural state.

If, then, we were to restore to the blood the principal elements which it lacked, we should make it again capable of exerting its regular influence upon the economy. This end is attained by Iron.

How does iron act in chlorosis?

Upon this point there are two very distinct opinions.

The majority at the present day believe that iron, when absorbed, passes directly into the blood, is there precipitated in the form of oxide, restores to it immediately the principles which are wanting, and makes the blood a reparative fluid at once.

Others attribute to this remedy a purely tonic action, in virtue of which the digestive and nervous functions are so influenced as to make innervation and nutrition more perfect—the organic restoration taking place indirectly, by means of this tonic action.

In support of this opinion we are able to quote the authority of Claude Bernard ("Leçons faites au Collége de France," published in the *Union médicale*, 1854).

"The real question," says this eminent physiologist, "is not, whether iron cures chlorosis, but, in the first place, whether chlorosis is due to the absence of iron, and if iron given as a medicine will fill the place of that which is wanting.

"Certain authors have claimed that the proportion of iron in the blood of chlorotic persons was lessened, but they have not proved the fact chemically. Those, on the contrary, who have made the analysis, have found that the amount of iron was the same in chlorosis as in other cases. It is true that in this disease the amount of globules is diminished.

"Let us suppose—as is probable—that there are about 6 grammes of iron in the mass of the blood, and that in chlorosis the blood loses 3 grammes. If all the iron which is given were absorbed, we should soon see the blood regaining this amount; but we know that it requires at least a month, and often much longer, to cure the disease, in spite of the masses of iron which are swallowed."

Another difficulty here meets us: we cannot positively prove the absorption of iron in the stomach or intestines. Bernard injected iron-filings—the lactate, etc.—into the stomach, but was never able to discover in the blood of the portal vein a larger quantity than is usual.

"But," continues Bernard, "since iron exists in the food, a certain combination may be required in order to effect absorption."

There is, however, one fact which is positive and perfectly demonstrated: the salts of iron (adds Bernard) exercise a special action upon the gastric mucous membrane. Every portion of the membrane which is touched by them assumes a more active circulation. Iron, therefore, is a direct excitant.

In conclusion, Bernard puts this question:

"May not chlorosis be due to a faulty digestion? May not iron re-establish these disturbed functions by the excitation it produces?"

It is possible that Bernard has not said the last word upon this question. But we see that the data furnished by chemistry are far from satisfying him; and, if he has not yet solved this grave difficulty, he at least has the merit of placing us on the road to its solution.

Two points remain to be settled: on the one hand, the conditions which favor the absorption of a certain quantity of iron by the stomach are to be determined, for such absorption seems to us unquestionable, though it be not fully demonstrated by chemistry; on the other hand, the mysterious combination must be ascertained, which enables the minute and imperceptible absorption to take place. And finally, we must discover the secret of the mechanism by which the atoms of iron, drifting through the circulation, revivify the impoverished and altered globules, and build up the body.

The facts, or such as seem best demonstrated at present, are as follows: 1. The blood of chlorotic women contains less of the globules than is the case in well women. 2. Under the use of the chalybeates, the blood usually recovers quickly the cruor and the globules which it had lost. 3. Iron given to chlorotic patients seems to have two methods of action, distinct, but equally necessary. For, firstly, it acts as a tonic and direct excitant of the stomach, or (if we prefer the expression) as a special modifier of the peptic sense; and secondly, a part of the iron is very probably dissolved in the gastric juice and absorbed, coming directly in contact with the inner coats of the vessels; while, by virtue of an action which we call dynamic or vital, without attempting to examine or to define it, the medicine by slow degrees places the impaired functions of hæmatosis * upon a normal footing. It is the combination of these two actions that reconstructs the blood-globules, and finally cures chlorosis. Such, in our opin-

* We refer especially to that action of vital chemistry which takes place in the great circulatory system: an important action, too little noticed by our physiologists, which commences in the left cavities of the heart, is continued in the entire circuit of the blood, and is perfected in the capillary extremities.

ion, is the true part played by iron in chlorosis; such, at least, is the interpretation which seems to us most rational and acceptable, drawn from the most recent researches in organic chemistry and experimental physiology, and in harmony with good sense and tradition.

Chlorosis, till very lately, was a triumph for the defenders of the chemical theory. "Evidently," said they, "this disease is due to a diminution of the iron in the blood. By giving iron, we restore the principle which is wanting, and the disease is cured. What is more simple, clear, and decisive?"

Unfortunately, the two bases of their theory, supposed to be unassailable, have been shaken by experiment. And we may add that, in the recent long discussion in the Academy, the chemists of most authority offered no new argument in support of their theory. The result of this debate and the general tendency of opinion show that chlorosis will soon, like the rest of pathology and therapeutics, be surrendered to the vitalists.

Chlorosis, we do not hesitate to say, rules the pathology of woman; and the physician who cannot recognize this affection in its various forms will often fail in treating this class of diseases. M. Nonat infers from the frequency of abnormal bruits in the neck of children that eight in ten are chlorotic (Acad. de méd., 18 Septembre, 1860). This is hardly the place for a pathological dissertation; but, as we entertain certain views upon chlorosis which are not generally admitted, we shall have to place the reader at our own point of view by an explanation; it would otherwise be impossible for him to understand the close connection between affections which seem very distinct, but which, recognizing the same cause, obey the same therapeutical agency—that of iron.

In its most marked and unmistakable form, chlorosis is accompanied by the following symptoms:

General loss of color of the skin and the mucous membranes; slight emaciation, puffiness of the face and the lower extremities.

Nervous condition, hysteria, melancholia, mobility, muscular debility.

Neuralgic pains, usually of irregular type.

Increase or diminution of the volume of the heart; ventricular impulse sometimes more energetic, sometimes more feeble than in a condition of health; bruit de souffle, generally soft, with the first sound of the heart; second sound sometimes sharp; various souffles in the great arteries, especially the carotids, subclavians, etc., and in the veins of the neck.

Pulse more frequent than in health; febrile heat, dryness of skin, thirst.

Panting upon the slightest movement; palpitations.

Dyspepsia, pyrosis, depraved appetite, gastralgia, sometimes vomiting, habitual constipation, diarrhœa when the disease has lasted a great while.

Menstruation painful, irregular, scanty, wanting in color, absent; leucorrhœa; menorrhagia; sterility.

Such is the picture (or the outline) of chlorosis. Under the influence

of ferruginous preparations, this frightful array of symptoms usually disappears with rapidity.

"How should iron be given in chlorosis, in what dose, and how long?" These questions have hardly been touched by therapeutists, and few practitioners have taken the trouble to study deeply. We except Sydenham, who has given the principles of good treatment, but has not sufficiently insisted on certain minutiæ, of the great importance of which we are convinced by long experience.

The slightly soluble preparations ought to be used in general at the beginning of treatment. Iron-filings, aperient crocus martis, hydrate of peroxide of iron, occupy the first rank. They are given in powder in a spoonful of broth, or in preserves, morning and evening, at the two chief meals, in doses of from 5 to 15 centigrammes (·8 to 2·3 grains). If this dose is easily borne, it is gradually increased, until by degrees the quantity of one or two grammes (15—31 grains) at each meal is reached. It is essential that the remedy should be taken at the beginning of the meal, for, if taken in the morning fasting, as is sometimes ordered, the patient feels a weight at the stomach, and a great sense of disgust, and loses appetite.

There is another reason for giving it at meals, for it is only at those times that the gastric fluids contain a sufficient quantity of acid, while, a little before eating, they are slightly acid or neutral, and sometimes even alkaline. If pyrosis exists, the best time for taking iron would be, for obvious reasons, the interval between meals.

If slightly soluble preparations are well borne, and if improvement does not occur, we must give soluble preparations, and in particular the tartrate of iron and potassium, given in pills or in gaseous waters. For certain women, we prescribe the tartarized tincture of iron, ferrated water, chalybeate wine, etc.

This treatment is not to be interrupted at the monthly period, and is to be continued till all the symptoms of chlorosis have disappeared. We then cease giving it; a month later we resume it, and continue it for two or three weeks. Then we leave an interval of two months; then we give the iron for a fortnight; and this plan is to be followed up for five or six months, for if it be easy to cure chlorosis, it is hard to cure it in such a way as to be secure against relapses, and relapses are always to be feared if we suspend the use of iron suddenly.

Chlorosis is considered by some pathologists as a very slight malady; but we consider it a very serious affection which many women never forget as long as they live, being either in continual danger of a relapse, or else (as is more common), in continual trouble from some of the functional disturbances which come in the train of chlorosis, although apparently in health.

It is also a fact which is observed as one grows older in practice, that iron, after having relieved the worst symptoms, sometimes becomes all at once impotent. The remedy, in such cases, acts with a certainty inversely

proportioned to the duration of the complaint and the number of the relapses.

Some patients have a singular experience. For a while they bear large doses of iron and improve rapidly, but suddenly they find the remedy disagrees with them, and seem to be in a sort of state of saturation. The physician should then pause, and begin again according to the method which we have mentioned above.

Evident as may be the indication for the use of iron, it is not always easy to fulfil it. The condition of the stomach and intestines—a susceptibility which cannot be foreseen—may form a great obstacle. Yet we ought to keep the aim constantly in view, and to persevere for weeks or months in modifying this irritability, or accustoming the system to the effects of iron.

Nevertheless, when the signs of chlorosis exist, we must suspect a woman who bears iron badly, for such intolerance is usually the sign of a bad diathesis.

When chlorotic patients are disposed to diarrhœa, iron ought not to be given at first, and the soluble forms should never be prescribed. For a time we should give subnitrate of bismuth, colombo, diascordium, phosphate of lime, in the dose of 25 to 50 centigrammes (3·8—7·7 grains) at each meal, nitrate of silver in the dose of 1 to 5 centigrammes (·15—·77 grain) in a draught taken during the day, to check the diarrhœa.

When we have reason to suppose that the gastric irritability is quieted, we give at first, with the above, small doses of iron-filings, or of any other slightly soluble preparation, gradually increasing the proportion of iron until it is borne in the amount of 1 or 2 grammes (15 to 31 gr.).

When there exists stubborn constipation, we add a soluble salt (as the tartrate or citrate) of iron, in pill, to aloes, and a little belladonna; giving per diem 5—10 centigrammes of aloes (·7 to 1·5 gr.), one or two centigrammes of extract of belladonna (·15 to ·3 gr.), and 75 centigrammes, 1 gramme, 2 grammes of the iron salt (12, 15, 30 grains).

Aloes has here the double advantage of acting as a laxative and as an emmenagogue. It follows that, if menorrhagia exists, as it often does, aloes must not be given, but in its place powdered rhubarb, or (still better) magnesia, to be taken before bedtime.

It is a received opinion among physicians, that chlorosis is confined to young girls, febris alba virginum. This idea, generally received, is false in every respect, and it daily gives rise to mistakes which have a very fatal effect upon the treatment. Chlorosis is in general a disease of adolescence, but it is also very frequent in adult life; it appears in women at the change of life; and we have seen it twice at a later period—in a woman of fifty-two, and in another of fifty-seven, both of which cases were characteristically marked, and were easily cured by iron.

We long regarded iron as a harmless agent, which it was not easy to abuse. Now that we have grown a little old in practice, we declare that

we have repeatedly seen patients whose death seemed to us due to the untimely use of preparations of iron.

It is easy to see, *a priori*, that by increasing the stimulant properties of the blood in a healthy person, we predispose him to diseases to which he had no previous tendency.

It is also easy to understand how a woman, whose blood has lost three-quarters of the normal amount of globules, may, while suffering from the accidents which belong to chlorosis, enjoy a certain immunity from the diseases which attack by preference persons whose blood is rich in these elements.

In some instances, women, though strongly predisposed by constitution or inheritance, have escaped all complaints of the chest for several years, while in a chlorotic condition; but when subjected to treatment with iron, acute phthisis has quickly followed the cure of the chlorosis.

These are positive facts, and they have been so often repeated in our sight, that we now refuse to give the preparations of iron to chlorotic women, if they have previously had suspicious symptoms of the chest, or have tuberculous parents. In these cases we try to support the strength by neurosthenic tonics, and we are not in haste to use iron, which often is speedily fatal.

We desire not to be understood, however, as systematically excluding the preparations of iron from the treatment of pulmonary phthisis. It is important to draw a distinction. We confidently state, as the result of many observations, that iron is usually injurious in the first period of this malady; we mean when the development of the tubercles is accompanied by pronounced phenomena of congestion or of irritation of the apparatus of respiration or circulation, as hæmoptyses, rough cough, fever with dryness of the skin, sharp pains in the chest, etc. In these conditions, iron, often given as an article of routine treatment, on account of the weakness and the poverty of blood, is formally contra-indicated, as is the tonic and analeptic regimen.

But at a later stage the case is changed. If a patient, for instance, has been weakened by repeated or abundant hæmoptyses, and his expectoration, sweating, diarrhœa, etc., have exhausted him, the iron preparations will then be properly used, to give a little vigor to the languid digestive and assimilative functions. Unhappily, however, in these cases, iron loses a great part of the wonderful virtues which it possesses in chlorosis and in accidental anæmia succeeding simple hæmorrhage. But, while it accomplishes nothing against the tuberculous diathesis itself, it is sometimes useful by helping the unhappy patient to struggle for a time with the cachectic state, which is more injurious to him than the local lesion.

The greatest circumspection must be used in these cases. Circumstances may seem imperiously to demand the use of iron, but it will not always be well borne, and in general, it is far from being so harmless as many practitioners imagine. These remarks apply with especial force

to tuberculous phthisis, in which experience has shown that iron generally does more harm than good. Phthisis of scrofulous origin differs from this in the slowness of its course, the slighter intensity of the inflammatory and reactionary symptoms, and especially in its greater tolerance of tonics and excitants. Thus, in children who are at the same time lymphatic and strumous, affected with caseous pneumonia and tubercles in the mesenteric glands, it is not uncommon for iron, in moderate doses, to improve the nutrition, sustain the vital resistance, and check the progress of the malady for a time.

In general, as we said above, a practitioner ought to distrust a chlorotic patient who bears iron badly at the outset of the first treatment, or whose condition is not modified by a proper administration of it. He should infer the existence of some latent diathesis, or grave organic disease, or moral affection, holding the chlorosis under obstinate control.

The tuberculous diathesis is often masked under the form of chlorosis. The physician vainly attacks the apparent disease; obstinate gastralgia, continued diarrhœa, painful palpitations of the heart, troublesome oppression, sanguine congestion of the face, especially at evening and after eating, are produced or persist, and the blood is slow to regain the globules which it lacks; happy are they whose blood does not restore itself at the physician's will, for they will pay, by a speedy disorganization of the lungs, for this momentary hope of health.

In practice, whenever a young girl has some symptom of chlorosis, or merely anæmia, iron is sent for in haste. A commencing phthisis is thus often spurred into activity. Doctor Millet, of the colony at Mettray, has had more than sixty cases of phthisis in which preparations of iron have been given by nuns or druggists, to the great injury of the patients.

A cachexy, which completely resembles chlorosis, is often associated with albuminuria, chronic engorgement of the liver or spleen, or a valvular lesion of the heart. Here, at least, iron does no harm; it is even of unquestionable utility in the treatment of the anæmia, which appears to depend on hypertrophy of the spleen or liver, especially when these lesions follow intermittent fevers, and are not accompanied by organic lesion.

Component Elements of Chlorosis.

The group of symptoms which we have named is not always found combined in chlorosis; most frequently, in fact, some of them are absent. To use the happy expression of Récamier, the symptomatic *phrase* is incomplete; but it is necessary to recognize it even in its incompleteness, or else we shall fail to attack the root of the malady, and shall be struggling with a mere accident, which may be banished for a moment, but will soon return with equal intensity in the same or a different form.

Paleness of the blood, and of the skin and mucous membranes, may exist alone without any symptoms besides shortness of breath and disor-

dered circulation. This form is the simplest; it is easily recognized and cured.

But quite often the common symptoms of chlorosis, as the nervous symptoms, indigestion, menstrual disturbances, appear together or singly before the pallor has reached its maximum; and then the common run of doctors—men who require all the elements in order to form a diagnosis—fail to see chlorosis, which really exists.

Nervous symptoms.—Women are often attacked by hysteria, by spasms, after great losses of blood, accouchement, lactation; so are young girls at the beginning of chlorosis. These nervous troubles easily yield to preparations of iron, although hysterical convulsions are not so easy to conquer as essential spasms. When, however, this spasmodic condition exists in a vigorous, high-colored woman, who exhibits none of the signs of chlorosis, iron increases rather than diminishes the convulsions.

Neuralgias.—These are almost a constant symptom in chlorosis; of twenty chlorotic women, nineteen, perhaps, will have neuralgia.

The disease is not always very easy to recognize, and the patient and physician may both be deceived. Women complain of pain in the head or stomach, in the side or legs, etc. A superficial examination shows nothing but a common headache, a stomach-ache analogous to that which accompanies difficult digestion, vague pains, attributed to fatigue or exhaustion; but when they are examined closely their neuralgic nature appears. The pain in the head occupies the brow, the temples, the region of the jaw, the teeth—in a word, the course of the nerves of the fifth pair and its branches; it scarcely ever attacks both sides at once, but it passes from right to left, or remains fixed in one point. All at once it shifts its place and occupies the region of the stomach, then it leaves the stomach and goes to the intercostal nerves, to the sciatic, or some of its branches, or the various branches of the lumbo-abdominal plexus. Then the cephalalgia reappears at the moment when the other pains cease.

This inconstancy in the seat of pain is very remarkable and very common; but sometimes the neuralgia affects a single region, the head, the stomach, or some intercostal nerves. It is rarely fixed obstinately in other parts, but we have observed it in the nerves of the heart, the clitoris, the superficial cervical plexus, one of the branches of the brachial plexus, the pharyngeal plexus (Türck: *Arch. de méd.*, 1862); but these cases are rare.

These forms of neuralgia, if we attend closely to them, are rarely seen in men, being confined almost wholly to feeble women, with distinct symptoms of chlorosis, past or present.

When neuralgia is the leading feature, whether occupying the head or the stomach, it is usually cured by iron, though less easily than simple chlorosis.

Temporo-facial neuralgia (called so improperly *tic douloureux*—a name which should be reserved for spasmodic neuralgia) has been treated

with advantage by large doses of subcarbonate of iron. Hutchinson, who may be regarded as the author of this method (Benj. Hutchinson: "Cases of Neuralgia Spasmodica," London, 1812), has observed nearly two hundred cases of cure. He gives from 2 to 4 grammes (30—60 grains) of subcarbonate mixed with honey, three times a day. Wittke has obtained the most happy results from it, in the dose of 1½ grammes (22 grains) with ¼ gramme (4 gr.) of cinnamon, three times a day (Hufeland: *Journal*, 1828, Vol. 4). The English journals are full of similar observations. M. Caulet reports remarkably rapid cures with the waters of Forges (Caulet: *Remarques sur l'action sédative immediate des sources ferrugineuses de Forges-les-Eaux*, Seine-Inférieure, 1867).

Having made a great many experiments in the therapeutic use of iron, especially the subcarbonate, and in cases of neuralgia, we can easily see the cause of the differences in opinion which exist. When given to chlorotic women, or in cases of neuralgia in incipient chlorosis, it has usually succeeded; but if given to men, or to women who were not chlorotic, it has usually failed. These results may be formulated by saying that the beneficial effects of preparations of iron in neuralgia are entirely due to the fact that the disease usually depends on chlorosis, which is curable by iron.

The cure of neuralgia by iron is not a rapid one, but requires a week, a fortnight, a month, or longer, in order to be complete. If the face is affected we always employ Hutchinson's method to quiet the accesses, and use without delay local applications of stramonium, belladonna, or chloroform, and hypodermic injections of sulphate or muriate of morphia; when the pain is relieved by these means, iron becomes of use by curing the general condition upon which the disease depends; it has thus a powerful effect in preventing relapses. It has not seemed to us that the carbonate of iron has any special utility, but that all the preparations of iron, if given in large doses, possess the same properties.

Gastralgias.—In chlorotic women, or women who present some of the symptoms of chlorosis, gastralgia has certain special features upon which it is necessary to dwell. At the outset it is not continuous, but returns at intervals of two, three, or four days; at a later period the intervals diminish, and the attacks occur daily, or several times in the twenty-four hours; their return is most apt to be caused by eating something. If the food is of a class which fatigues the patient, the pain may follow directly upon the ingestion; but in the great majority of cases the time elapsing between eating and the occurrence of pain is at least two or three hours. The sensation is sometimes that of a weight in the epigastric region, sometimes it is a pain resembling violent hunger, sometimes cramps or heat referred to the same region; it is usually confined to these parts, but may extend to the neighboring regions, and is almost always felt behind the sternum and in the back at the level of the stomach. It is often complicated with intercostal neuralgia, as M. Bassereau has remarked, and even seems to be an extension of this malady. The pains

are mostly accompanied by a sense of oppression, revealed by deep inspirations, yawning, and a desire to undo the garments which press closely upon the spot. And yet, spite of this frequent and often protracted suffering, digestion is perfect, food is retained, nutrition is effected suitably, and the fæces, by their consistency and appearance, indicate complete digestion of food. The appetite experiences a more or less distinct alteration, hunger is keen; but as soon as any food is swallowed an invincible satiety is felt. Yet some eat much and greedily; but the meal is hardly ended when they are hungry again, and their hunger sometimes comes so suddenly and so frequently that they place food by their bedside to consume in the night. Thirst is commonly increased, though there is neither fever nor excessive secretion; it shares in the derangements which all the sensations connected with the digestive canal experience. In a word, sensation is disturbed, and function may be intact.

By these marks we recognize distinctly a nervous affection, and we cannot confound these symptoms with those of chronic gastritis, which is commonly accompanied by disgust for food, sharp pain just after eating, difficulty in digestion, and is soon followed by diarrhœa and wasting. We should also remark that the pains dependent on chronic gastritis never disappear, to be replaced by neuralgia of the face or head, and conversely, as is the case in gastralgia. This point is of great importance, for when an affection thus shifts its locality, its different manifestations probably have the same seat and nature, as may be seen in the progress of a catarrh or a rheumatism.

We have not spoken of heart-burn and vomiting as diagnostic points, for experience has shown us that these symptoms are sometimes found in purely nervous gastric affections, and we think they may be neglected as differential signs.

Gastralgia, once established, is accompanied by more or less marked derangement of the intestinal functions; the stools become infrequent, the fæcal matters hard, and colics are common.

Gastralgia is almost always accompanied by leucorrhœa. This discharge gives no indication as to the usefulness of iron, for it is observed equally in certain gastralgias in which iron is far from suitable.

The form of gastralgia which is common to men and women who present no symptom of chlorosis, is of a remarkably fixed character, very different from that we have just described, and often alternating with neuralgic pains which occupy different parts of the body. In women it may coexist with a high complexion, moderate, but bright red menstrual discharges, and chronic leucorrhœa; chlorotic gastralgia is also accompanied by leucorrhœa, but the menstrual blood is light-colored, and the complexion usually pale. Chlorotic gastralgia is quite readily curable by iron, but the other kind is almost always aggravated by the same remedy.

Iron, under whatever form it may be given, is useful in chlorotic gastralgia; steel-filings, æthiops mineral, subcarbonate of iron, hydrate of

peroxide of iron, are the forms most commonly used. At the outset, we should always avoid the soluble preparations, because they often increase the pain. Iron is to be combined at first with a bitter extract and some aromatic.

It sometimes happens that a minimum dose of iron increases the gastralgia for several days. This will discourage the patient, but not the physician. Let him continue with the same doses until the gastralgia is at the same point as before the treatment was begun; he may add to the iron some centigrammes of belladonna powder. The dose of iron is then to be increased, and so on until at each meal 2 grammes (30 gr.), or at least 1½ grammes (23 gr.) of filings are taken. Then the soluble preparations may be used, and continued till the close of the treatment. We ought to enjoin the same precautions as are suitable in the treatment of chlorosis, namely: that the iron should be suspended and resumed several times, and even when gastralgia is quite cured.

When pyrosis coexists with gastralgia, iron is usually ill borne. We must then begin by giving magnesia in a slightly laxative dose for several days, and after a little while an infusion of quassia or simaruba. After this preparative treatment, iron will find its opportunity.

What we have said of neuralgia of the face is also applicable to gastralgia. It sometimes happens—especially in women who have had pains in the stomach for years—that, in spite of the use of iron, and long after the appetite and strength have returned, the gastralgia persists with discouraging frequency. In such cases the cure is completed by plasters of theriac, frictions with cerate of stramonium or belladonna, ammoniacal blisters, either simple or dressed with morphine, cauteries, moxas, the internal use of bismuth, magnesia, the poisonous solanaceæ, opium. The same list of remedies may be useful in certain cases in combating an increase of pain, caused by the use of iron at the commencement of treatment.

It remains to point out certain precepts in regard to regimen.

The food which the stomach digests without pain varies with almost every patient; some can endure nothing but milk; some are less tried by meat than by vegetables; others desire meat-pies and similar dishes.

These idiosyncrasies must be taken into account in regulating the diet, for we must not imitate those physicians who, considering the digestibility of foods as an absolute property, impose the same diet on all their patients; we must have regard to the susceptibilities of individuals, and, however bizarre they may seem, follow the lead which they offer. This is the method which we have followed as constantly as possible, allowing to the patient such articles of food as her daily experience has shown to be the most digestible. We have also striven to limit the quantity to one-quarter or one-half of that which a person in health would take; and when there is no dislike to any article, we order rich broths, white meats, roast meat, etc., avoiding as much as possible the farinaceous vegetables, such as haricots or lentils, the too frequent use of which in hospitals is

certainly one of the causes which render success less frequent in them than in private practice, in which green vegetables and fruits are prescribed.

Neuralgias occupying other parts than the nerves of the face and stomach must be treated exactly like temporo-facial neuralgia as regards local means; and as regards the chlorosis, by general means.

Asthma.—Amaurosis.— Whooping-cough.—There are certain neuroses which have been advantageously treated by iron, among which are the above.

Nervous asthma has been cured by M. Battaille of Versailles by martial preparations continued for a long time in large doses. He has treated three cases thus: all were women; the first was evidently chlorotic, while the other two did not seem to be. But even if the asthma were an accident of chlorosis, the therapeutic success of M. Battaille is still of great importance, as serving to confirm the fact which we have so often mentioned, to wit, that therapeutic indications are more frequently drawn from the general condition of the patient than from local symptoms.

M. Blaud of Beaucaire has reported in the *Bulletin de thérapeutique* (t. XVII. Nov., 1839) the case of a chlorotic woman who had suffered from amaurosis for a year. The physician believed that the blood, in its existing state of impoverishment, did not supply a proper stimulus to the organ of sight. He gave iron, and the patient recovered her sight and her health at the same time. M. Bretonneau made the same observation in the case of a man who had become cachectic as a result of prolonged intermittent fevers.

In whooping-cough, Drs. Steymann and Chisholme have praised the subcarbonate of iron. This remedy is not employed alone at all stages. The authors strictly prohibit it during the first period, and order that emetics shall always be given previously. Several well-proved facts seem to bear testimony in favor of this treatment. The dose of subcarbonate is from 50 centigrammes to 4 grammes (8—60 grains). In a few days, according to these physicians, the violence of the attacks ceases, and soon nothing remains but a catarrhal cough. We regret that we have not tried this plan in our own practice.

Menorrhagia.— Amenorrhœa. — Hœmorrhage. — Anæmia. — Many physicians, good observers, too, think that chlorosis is necessarily characterized by a marked diminution or a total suppression of the monthly flow. They regard the menorrhagia, that is, the excessive flow, as so rare an occurrence that they formally exclude it. But they cannot have failed to see often, in their own practice, women who are deeply anæmic and suffer from all the general symptoms of chlorosis, who suffer abundant losses of blood every month. In this case they make a distinction; they call the latter class anæmic, and those whose menses are deficient, chlorotic.

And yet, as we just said, these anæmic women have all the symptoms of chlorosis—the extreme pallor, the deficient color of the blood, the

bellows murmur in the heart and the chief vessels, and the various neuralgias; so that, if we should examine all their functions except those of the generative organs, we could not fail to see chlorosis.

We shall try, in our turn, to make a distinction between anæmia and chlorosis. Anæmia is an accidental condition, caused directly and without an intermediate stage by a great loss of blood; a person becomes anæmic in a few days or hours. Chlorosis is a permanent malady, usually slow in developing, and slow to leave the patient; always ready to be produced by apparently the most indifferent cause. Anæmia is essentially a transitory state; a few weeks are enough to restore the blood and the strength completely, without any other remedies but a good diet. Relapse is never to be feared unless a new loss of blood occurs.

M. Burcq has added certain other points of distinction. He says that he has observed that cutaneous sensibility is normal in anæmic patients, and changed in the chlorotic; the anæsthesia differs in the different regions of the skin. He adds that muscular force in the anæmic is nearly equally diminished in all the muscles, while in the chlorotic the loss of force differs in the different groups of muscles; in an anæmic person, the relative power of the right and left arm, for instance, is as in health, while in the chlorotic, the right side may be more weakened than the left, or inversely if the person be left-handed (*Gazette des hôpitaux*, 1864, p. 118).

Up to this point the distinction is as clear as possible; but in practice, nature by no means divides the sick into two such separate camps.

We may see every day the action of moral causes in producing chlorosis in a woman or girl; still oftener, the malady dates from the first application of leeches, which evacuated but a small quantity of blood.

If we understand this, we can easily see how an abundant bleeding at the nose, venesection, or repeated leechings, or a large menstrual discharge, may bring a patient into such a condition that chlorosis appears. Instead of simple anæmia, transitory, and curable by nature unaided, there is a special state of the economy in which the blood becomes more pale and fluid every day, although the original losses of blood have not been repeated.

Here, then, anæmia has become the starting-point of chlorosis; it has predisposed the economy to chlorosis, has rendered the latter easy, and its development rapid.

It is now proper to see what part anæmia and chlorosis may play in hæmorrhages.

We need not attend to the classic distinction between active and passive hæmorrhage; but we must admit that hæmorrhages from the uterus, and others, are sometimes associated with a condition of energetic reaction and a superabundance of life, and at other times occur in persons in exactly the opposite state. We will admit that in all hæmorrhages (traumatic and hypostatic excepted) there is a previous local action, analogous or identical with the first phenomena of inflammation; but we must exclude from present consideration all except general organic conditions.

The general state of the system plays here an extremely important part. When the menstrual molimen is the same, but the condition of the blood is different, it is impossible that the flow should not be considerably modified by the degree of plasticity of the blood; and, in fact, it is modified.

To take the simplest case first: see what happens in a recent wound in a vigorous, plethoric man, and in one who is profoundly anæmic.

In the former, the hæmorrhage is slight and quickly stops; though large arterial trunks have to be tied, it is needless to use a hæmostatic to arrest capillary bleeding; but in the other, even after the smallest trunks have been tied, a considerable amount of blood or of reddish serum continues to flow, which stains the dressing deeply, and by its abundance may involve danger to life.

What is observed in men may be seen in the different species of animals. A dog's legs may be cut off, he may suffer enormous mutilations, without danger to life from hæmorrhage, while rabbits die from bleeding after a slight wound. The plasticity of the blood of dogs forms an obstacle to hæmorrhage, while the liquidity of the blood in rabbits favors it.

The tendency of anæmic persons to hæmorrhage is marked, from the moment the loss of blood has occurred. If leeches are applied to a child for the first time, the loss of blood will be much less, other things being equal, than that which will follow the second application; and this, still less than at the third; until (as we have, unfortunately, often seen) the bite of one leech may cause a fatal hæmorrhage in a child previously exhausted by bleeding.

But if anæmia, considered as a transitory and as it were acute condition, may have such an immense influence on hæmorrhage, how much greater will be this influence if it has lasted for a long time, especially if chlorosis with all its accompaniments has been developed!

Now let us transfer to the mucous membrane of the uterus that which we just said in general. If a woman or a girl has an excessive menstrual discharge, the interval between the periods will doubtless suffice for some months to restore the blood; but the repetition of the same accident will soon bring on anæmia, and at last chlorosis. If the molimen remains the same, the flow, as we showed above, will become more abundant, and chlorosis, a cause of the increase of hæmorrhage, will itself be aggravated by the hæmorrhage; and the patient, revolving in this circle, will soon be in danger.

Let us therefore not lose from sight these leading facts: chlorosis is produced by excessive menstrual discharges; chlorosis may render the discharge still more profuse. In other words—

Too copious menses cause thinness and dissolution of the blood;

Thinness and dissolution of the blood are a cause of uterine hæmorrhage.

There is, then, a form of chlorosis which might be called menorrhagic.

Is this form common in young girls? It is rare; we estimate from our

records that it forms the twelfth part of the cases. In adult women it is more common. Yet we would say that our observations in private and hospital practice do not include a sufficiently large number of facts to furnish complete statistics.

We have collected a considerable number of cases of menorrhagic chlorosis, both in young girls and in married women. Not one of these patients had uterine lesions; this fact we proved by examination of all the married women; but in the case of the girls, where such examinations would have been difficult and unsuitable, we judged from the rapidity of recovery, and the good health which we observed for several years afterwards, that the uterus was exempt from severe lesions.

In speaking of treatment, two principal points are obvious: one, menorrhagia; the other, chlorosis.

Menorrhagia is combated by remedies which we usually think contraindicated in chlorosis; the treatment of chlorosis is supposed to be apt to excite the menstrual flow. It would seem impossible to avoid striking upon one of these two rocks.

Let us consider whether the preparations of iron are really emmenagogues. It cannot be doubted that iron restores the health and the uterine flow in a chlorotic woman who has amenorrhœa; but does the iron act as an emmenagogue or as a reconstituent?

Whenever we give ferruginous drugs in cases of chlorosis complicated with amenorrhœa, the first phenomenon observed is a return of color to the tissues, and at the same time, diminution of the depraved appetite, the pains in the stomach, the palpitations of the heart, shortness of breath, bellows murmur in the blood-vessels, thirst, etc., so that, after six or eight weeks of a properly conducted treatment, the appearance of most vigorous health returns; all goes well, but the courses do not yet appear. If we continue the treatment it is not rare to see actual sanguine plethora supervene while the menses are still absent.

Health is then re-established, chlorosis is cured—but amenorrhœa persists. Soon, in their turn, the menses appear and take the normal course. In such a case, iron acts at first as a reconstituent; and after the health has been re-established, the functions of health, including menstruation, are re-established in their turn. The patient does not recover health because her menses have returned under the influence of iron, but, on the contrary, the menses return because health has been recovered under the influence of iron. The point is completely proved, for if it were otherwise, we should have seen the return of menstruation give the signal for the return of health; whereas the contrary has occurred.

It is because they have not followed the evolution and succession of these different phenomena that practitioners have always imagined iron to be an emmenagogue; and this error, accredited for ages, will long continue to prevail against the most manifest facts, against the closest observation, for we are so made as to like to hold to an error, and to resist truth obstinately.

To go further, not only is iron not an emmenagogue, but, on the contrary, it is a hæmostatic. Thus, the experiments we have made on a large scale in our hospital show that, in women whose menses are regular, and who are free from chlorosis, the use of iron most frequently retards the menstrual flow and diminishes it. We say most frequently, and not always.

Next, let us see how the indications in menorrhagic chlorosis are simplified :

Leading indication, to treat the chlorosis.

Secondary indication, to treat the menorrhagia.

And the latter is so truly secondary that we scarcely ever have time to attend to it.

In fact, by giving iron in large doses between two menstrual periods, we easily restore the plasticity of the blood; before twenty-five days are past the complexion has regained almost its normal color, the subcutaneous veins have recovered their volume and their bluish tint. When, therefore, the menses reappear, the blood is already in such a condition that hemorrhage is less easy, and the discharge is often much less abundant, though much more highly colored.

We have sometimes, nevertheless, seen menorrhagia increased in spite of the treatment, and perhaps as a consequence of the treatment; but even in this case the debility and pallor which used to follow the menstrual period were much less marked than in the preceding month, and a few days made up for the loss. But observe that in such a case, even when the loss of blood is absolutely greater than before, the relative loss is much less. It follows that the health suffers nothing, or next to nothing, from the bleeding, since the injury is repaired almost at once by the treatment.

But if, in spite of the use of iron, menstruation is as abundant as previously, if its amount is even increased, there are other remedies which almost always suffice, in the front rank of which we would place powdered ergot, digitalis, acids, rhatany, plugging, powdered bark of yellow cinchona given in doses of two or three grammes a day (30—45 gr.), etc., etc.

As soon as the menses are over, we must resume the use of iron for eight or ten days, in a dose proportioned to the patient's weakness. If a little anæmia or chlorosis remains, we should insist on iron during the entire month, and even during the menstrual period, unless the menses are so abundant as to require the use of another remedy.

Such, in rapid outline, are the practical rules, to which the physician may add those details which are best taught by having to treat an obstinate malady.

Nose-bleed, in chlorotic patients, observes the same laws as uterine hemorrhage. We have known a young lady of twenty-one who had extremely abundant nose-bleed every day. Acids, astringents taken internally and by injection into the nasal cavities, had been tried in vain ;

powdered cinchona, taken internally, which almost always succeeds in these cases, had likewise failed; the bleeding returned continually. The use of large doses of subcarbonate of iron cured the chlorosis and greatly checked the loss of blood.

It would be a mistake to suppose that uterine and nasal hæmorrhage is cured by iron only in the case of chlorotic young girls. We have treated several cases in women at the turn of life, who were exhausted by repeated metrorrhagia. In spite of the apprehensions of the physicians who met us we insisted on preparations of iron, and succeeded in easily checking the hæmorrhage. This practice is conformable to that of Phil. Frid. Gmelin ("Dissert. de probato tutoque usu interno vitrioli ferri adversus hæmorrhagias spontaneas largiores" (Tübing., "Thesaur. mat. med.," t. II.).

Iron in this case has a double action, as we said above. At first it repairs the losses of cruor and fibrin; next, it increases the plasticity of the blood, makes it more coagulable, and thereby lessens its facility of escape.

Very unlike the other hæmostatics, which for a moment increase the coagulability of the blood without restoring its constitution and relieve only the actual symptom, iron may be of use in certain phases of melæna and hæmorrhoids; not as combating the organic lesion which gives rise to hæmorrhage, but as remedying the consecutive anæmia; by restoring the plasticity of the blood, it may cure, if the hæmorrhage depends solely on the liquefaction of the blood, and may limit, if the liquefaction, though consecutive, is itself a cause of hæmorrhage. In a word, we must repeat here that which we said before under metrorrhagia. Let us recall the results of the analyses made by MM. Andral and Gavarret. They found that, in cases of sanguineous apoplexy with effusion, the globular portion was more abundant than in most patients. In these hæmorrhages, justly called active, iron would very probably be injurious. But if these observers had analyzed the blood of persons exhausted by hæmorrhoidal flux, they would have clearly found a diminution of the globules, which would have proved the propriety of using iron.

We may then conclude: 1st, that iron is not an emmenagogue; 2d, that in chlorotic patients it seems to provoke the menstrual discharge, because it cures the chlorosis; 3d, that in women in health it usually modifies the uterine flux; 4th, that it restrains uterine hæmorrhage, at least, when apparently disconnected with plethora; 5th, that it moderates the various hæmorrhages which occur in chlorosis.

Dysmenorrhœa.—When the menses are painful, and the blood a little discolored, the use of iron in the interval very often suffices to put an end to the symptoms; but when this treatment is inadequate we should add vaginal injections of a strong decoction of stramonium or belladonna, or of a little oil, in which a few drops of chloroform are dissolved.

Sterility.—The preparations of iron make women fertile; this fact is as authentic as its emmenagogue properties, and was clearly stated by

Hippocrates (Opera, ed. Fœsii, t. I., sect. v., p. 686). The fact is easily explained. Chlorotic women are usually sterile, and so are those whose menses are excessive or very painful; iron, therefore, which relieves all these troubles, is readily seen to be capable of relieving the sterility which is due to them. M. Blaud, of Beaucaire (*Bulletin de thérapeutique*, t. XVII., nov., 1839), has added facts which confirm this view.

Cachexiæ.—To say (as did the writers of former centuries) that iron cures the cachexiæ, is to use a very vague expression; yet the expression is true in some points.

If the serous portions of the blood predominate, in consequence of cancer or scrofula; if hæmorrhage from a cancerous ulceration causes anæmia; if poor and insufficient food impoverishes the blood, there is no doubt that by the use of iron we may get, not a cure, but a beneficial modification of the general health; but the hope of cure which may arise is always destined to disappointment, since the cause remains, and is more mighty to destroy than the remedy to build up.

Dropsies.—Visceral engorgements.—It is certain that in a very advanced stage the heart no longer fulfils its functions normally, and that, besides, the blood has not its natural qualities. The consequent disturbances of circulation, both general and capillary, affect the economy in the same way as if there were an organic lesion of the heart. Hence, engorgement of the lungs, hypertrophy of the liver, dropsy, anasarca. Iron, by curing chlorosis, cures all these symptoms; but we must not infer that iron can cure them when due to other causes.

Intermittent fevers.—In the same way we may speak of the influence of iron, not on the fever, but on the accidents which may retard a cure or provoke a relapse. Bretonneau has shown that the miasms which cause these fevers, before they developed into well-marked paroxysms, often produced anæmia; that intermittent fever developed with a readiness proportioned to the amount of blood which the patient had lost, or the degree to which the blood was impoverished; that the fever, after lasting some time, brought about—especially in women—a very pronounced state of anæmia, so that anæmia was at once a predisposing cause and an effect.

Sydenham and Stoll knew from experience that chalybeate wine, and, in general, the preparations of iron, are a useful adjunct to cinchona. Bretonneau, in imitation of these great masters, introduced it into his hospital practice, and found it extremely useful in preventing the access and return of intermittents, and in curing the leuco-phlegmasia and the splenic engorgement which follow prolonged fevers. He was accustomed to give iron in these cases several months at a time, with preparations of cinchona. The direct febrifuge action attributed by Marc to iron (*Journ. gén. de méd.*, 1810), by Martin (*Bulletin de la Société méd. d'émulation*, août, 1811), and by d'Autier, in a good many experiments made by Bretonneau and M. Barbier, of Amiens, has not been proved.

As regards the use of Prussian blue as a substitute for cinchona in

treating intermittents, we will speak further of it under the head of preparations of cyanogen. We will state, however, that we have very little faith in its efficacy in the class of cases which we are considering.

Scrofula.—Among the many remedies used in this disease, iron occupied the first rank before the discovery of iodine. But its action is very equivocal, and the known efficacy of iodide of iron in these diseases is not a sufficient proof.

Certain experiments have been made by Cl. Bernard upon animals, and have been repeated by M. Quevenne upon himself with much care, which show that iodide of iron, when introduced into the stomach, almost immediately undergoes a sort of resolution into its constituent elements. In a very short time, iodine, having been rapidly absorbed, is found in the saliva, and passes in considerable quantity into the urine. This elimination continues, at first in increasing amounts, then decreasing, so that after forty-eight hours three-fourths of the iodine ingested has been rejected by the emunctories, while after the same time the quantity of iron absorbed and carried away by the metalloid is hardly appreciable. From this extreme difference in the results of absorption may we not be justified in inferring that in the very special affections for which iodide of iron is habitually used (that is, in scrofula), the greater part of the action is due to iodine, without claiming that that of iron is absolutely null?

Diabetes.—Heine, of Berlin, regards the sulphate of iron, taken internally, as a kind of specific for the diabetes mellitus of children. He quotes from the *Journal des maladies des enfants* two cases which seem quite convincing; but before pronouncing upon the efficacy of this remedy, we shall see whether our personal experience confirms such rapid results in a disease usually so obstinate.

Leucorrhœa.—Blennorrhagia.—In simple utero-vaginal catarrh connected with chlorosis, iron has a manifest utility; but it increases the white discharges in women of high complexions. It has very little influence upon the leucorrhœa which accompanies ulceration of the neck of the womb.

Blennorrhagia has been cured by iron in some cases; in the last stage of the disease, after the symptoms of inflammation are gone, workmen often cure themselves by drinking for several days large quantities of the water in which the forge-men quench red-hot iron, which contains a good deal of iron. It would doubtless be better to use large doses of ferruginous preparations, or of the tartrate or chloride of iron. We will add that M. Ricord very often uses a solution of tartrate of iron and potassium (4—8 grammes to 100 grammes of water) to dress venereal ulcers, especially when these ulcers threaten to assume a phagedænic character.

Preservation of water.—For some time, sheet-iron boxes have been used to hold the water for long voyages. The subcarbonate of iron, which forms and dissolves in minute quantities in the water, has the double advantage of preventing the development of plants and infusorial

animalcules, and consequently preserving it from corruption, while it also acts favorably on the health of the sailors.

Poisoning by arsenic.—The hydrated sesquioxide of iron has been recommended in the treatment of poisoning by arsenious acid.

In this case an insoluble arsenite of iron is formed; or at least, a salt so far insoluble that purgatives can remove it before it has time to affect the system. But the arsenite of iron is easily dissolved by the hydrochloric and lactic acids which are naturally formed in the stomach; it is therefore important to neutralize them, which may be done by giving the sesquioxide in excess.

This important remedy can only be of use when the physician is very quickly called, for a few moments are enough for arsenic to inflict general and local injuries which are irremediable.

In certain medico-legal cases it may become of extreme importance to know that the hydrated sesquioxide of iron itself is often arsenical, when prepared from commercial sulphate of iron.

Poisoning by salts of copper.—Iron-filings are among the best antidotes in cases of poisoning by salts of copper. The filings should have all their metallic lustre. The reaction is as follows: an innocuous salt of iron is formed, and the copper is precipitated in the metallic state.

Use of Preparations of Iron in External Maladies.

The soluble preparations usually possess more or less astringent power. They drive the blood from the tissues with which they come in contact, they suppress or modify the secretions, they arrest or check hæmorrhage, and in general, all kinds of flux; in a word, they exactly satisfy the various requirements which we commonly try to meet by the substances called astringents. In this respect it is important to establish one distinction. The insoluble preparations are preferable for internal use, and the soluble for external; but the latter may also be used internally.

Among the soluble salts most in use for external application, are the sulphate, the muriate, the acetate of the peroxide, and especially the perchloride, which deserves our more special attention.

Perchloride of Iron.

External Use.—For some years this agent has held an important place in therapeutics, both as a hæmospastic, and as a hæmostatic and astringent.

Every one knows that Pravaz was the first to use it by injection in the cure of aneurism.

The first trials were far from encouraging; but it seems to have had better luck since: some half-successes in certain aneurisms, more complete

successes in the treatment of varices and hæmorrhoids, both with the perchloride and with the acetate of the peroxide, are the latest results; so that the method seems to have some chance of redeeming the disgrace into which its first failures cast it.

Further careful trials are needed before we can definitely judge of this great question.

If the treatment by injection, in diseases of the arteries or veins, triumphs over the immense obstacles which arrested it at its birth, the honor will belong first to Pravaz, who took the initial step, and next to the intelligent perseverance of the surgeons of Lyons.

However doubtful may be the value of perchloride of iron as injected into the blood-vessels, there is no doubt as regards its external use.

In a mémoire presented to the Académie des sciences, in September 1853, M. Pétrequin mentioned a large number of cases in which the perchloride of iron, or of iron and manganese, may be used with advantage externally.

Thus, when the bleeding comes in a sheet, from a wounded surface, he states that it suffices to wash the surface with cold water, and then to apply a compress soaked in a mixture of a teaspoonful of the concentrated solution of perchloride in a glass of water. If the flow is not arrested, we shall succeed by adding to the mixture a second teaspoonful of the perchloride.

If the wound is unequal and irregular, a tampon of charpie moistened in the same liquid is used before the compress. This procedure may suffice even when the bleeding comes from a small artery. The charpie might be replaced by amadou, sponge or linen, which will further serve as a compressor of the vessel.

A plug of charpie or amadou dipt in pure perchloride and applied with the finger instantly checks the blood from leech-bites.

This measure has succeeded in cases of epistaxis where plugging and other hæmostatics have failed.

We are acquainted with no better means of arresting dental hæmorrhage, which, as we know, is sometimes so refractory.

The solution of perchloride has been proposed in sanguineous tumors, hæmorrhoids, vascular fungi; and by Dr. Yvonneau (*Bulletin de la Société d'Indre-et-Loire*, 1854) in the treatment of ingrowing nails.

This solution has been of good service in various affections of the genital organs, especially in metrorrhagia, leucorrhœa, and laxity of the vaginal walls.

The remedy may naturally be used in engorgements of the neck of the uterus, especially those varicose or inflamed states which have been of late commonly treated (perhaps a little abusively) by caustics and heated iron: for where alum or tannin, applied locally, often cures, much may be expected of a remedy possessed of properties so remarkably astringent, resolvent and hæmostatic. The trials which have lately been made have entirely justified these hopes. Employed alone, or, still better, associated

with collodion, the solution has effected in the above-named class of cases cures which promise well for its future career.

M. Pétrequin says that the perchloride is an excellent antiseptic in gangrenous wounds and fetid suppurations. Washing with a solution of various strength rapidly removes the fetor—a property important in the hygiene of hospitals.

For some years past a large number of physicians, including Drs. Bourot and Salleron, have studied the disinfectant and antiputrescent virtues of perchloride of iron; it may be said that the excellent results obtained in purulent and putrid affections, in all ill-conditioned sores, and especially in hospital gangrene, insure to this remedy an important place in surgical practice, especially military surgery. In this respect we may say that the perchloride may rival the most renowned antiputrescents, such as the iodated preparations.

The perchloride has also been used in a great variety of obstinate scrofulous affections of the skin and mucous membranes; and M. Bazin, among others, has found it very useful in certain malignant scrofulidæ. It has been used with success in some parasitic diseases, as mentagra, tinea, acne.

Finally, there is another instance of external use which deserves special mention: the use as a preservative from syphilis. We owe this new application to Dr. Rodet, a distinguished physician of Lyons. Its importance may be immense, if the future confirms the results which are announced.

Let us say, first, that the perchloride of iron, whatever its degree of concentration, does not of itself suffice to confer this immunity; but that, in order to insure complete efficiency, a free acid, such as muriatic—or better, nitric—must be added to it.

M. Burin de Buisson, who has carefully studied the chemical action of the perchloride, explains the necessity of this addition as follows: When the perchloride is applied over the point of inoculation, the immediate effect is the formation of a coagulum in the albuminous portions of the blood, which, acting as a plug, prevents the preservative liquid from penetrating deeply enough to reach and completely destroy the virus. Now, the addition of an acid removes this obstacle by redissolving the coagulum, and by aiding the penetration of the perchloride into all the folds of the mucous membranes and the interior of the tissues to which it is applied.

According to the same chemist, the perchloride acts by coagulating, and not at all by cauterizing; it preserves, by forming an obstacle to the absorption of the virus, by drawing out the albuminous fluids which surround the inoculated point, and causing them to coagulate as they approach that point. In this way the virus, seized and imprisoned as it were in the midst of the albuminous coagula, is first neutralized, or destroyed, and soon eliminated.

Whether the preservative liquid invented by M. Rodet acts as a co-

agulant or as a caustic, is not a question for us to decide. The following formula has been adopted as the best, after long trials:

℞. Pure water..... 24 grammes (370 grains).
Perchloride of iron, liquid, at 30°... 12 grammes (185 grains).
Hydrochloric, or better, citric acid.. 4 grammes (61 grains).
M.

We cannot now enter into the details of the great number of experiments which have been made in the hospitals of Lyons; but we should add, that the results are nearly constant, and seem to show that the Rodet liquid possesses the power of neutralizing the virus of syphilis introduced by inoculation, and of preventing the development of consecutive accidents. We will add that the same effects have been observed with vaccine virus.

But will these preservative powers act with equal certainty when the liquid is applied after the sexual act? Certainly, the results thus far are adapted to give rise to hope; but, on the other hand, it would be a rash thing, in so grave a matter, to utter our judgment before a long and severe trial had been made. Besides, in this case, the value of the remedy is not the only point in question, and success must depend on many considerations of quite another nature.

The method of application, as given by the inventor, is as follows:

As quickly as possible, after the suspected coïtus, the part is washed in water, to which is added the preservative liquid, in the proportion of one tablespoonful to one or two glasses of water. Charpie, or linen, soaked in the pure liquid, is immediately laid on the part supposed to be contaminated, and allowed to remain for a quarter of an hour, care being taken that the liquid penetrates all the folds of skin and mucous membrane. During this application, an injection of the aqueous mixture above mentioned is to be made. Finally, the parts are washed in cold water.

Doubtless this proceeding is easier and more certain in men than in women; yet it is applicable to the latter, in the form of injections of the mixture into the vagina, or, of applications of the pure liquor on a piece of linen held between the labia majora and minora.

But even if our enthusiastic expectations are not all realized, and the hope of the final suppression of syphilis in a future day be only a beautiful dream, M. Rodet will certainly have rendered a signal service to humanity, if, thanks to the preservative and to the system of precaution which its use requires, even a considerable diminution of the chances of contamination should be attained.

We ought to add that M. Rodet proposes his "liquide chloruro-ferrique" not merely as a prophylactic against syphilis, but as a cure for the same disease. According to his experiments, the liquor modifies simple and even indurated chancres with truly remarkable rapidity,

sometimes arresting in twenty-four hours the power of secreting virulent pus.

Assuredly these results are worthy of all the attention of physicians, and we wish with all our heart for their confirmation.

This application in syphilis has naturally been followed by a similar treatment of other virulent diseases. M. Rodet, assisted by his brother, a distinguished veterinarian of Lyons, has made a series of experiments with the object of destroying the virus of rabies and of glanders introduced by inoculation, and he seems to have obtained quite conclusive results with his liquid.

But as regards hydrophobia, prudence directs a reserve of opinion; until the demonstration is complete, it will be better to first burn the bite with red-hot iron, and afterwards, if there is opportunity, the liquid may be made to penetrate the remoter parts of the wound, which the iron could not reach.

We shall further mention the application of the preservative to poisons, especially that of the viper; but it is plain that success must depend on a very speedy application, on account of the exceptional rapidity with which absorption occurs.

The chances of success will be much greater in the case of bites of gnats, wasps, bees, etc.; it cannot be too highly recommended in the bites of certain flies which so often, in summer, occasion charbon.

The preservative liquor is specially recommended by Dr. Pétrequin, in dissection wounds.

Internal use.—Great as has been the extension of the external use of perchloride of iron, its internal use has been equally enlarged.

Its usefulness as a hæmostatic naturally suggested its application to the treatment of internal hæmorrhages. It has in fact been used from the first, in hæmoptysis, gastrorrhagia, and certain intestinal hæmorrhages.

The results obtained in these various cases were often good, but they were improved when the time for administration was better understood; this should be as distant as possible from the hæmorrhagic molimen, especially in active hæmoptysis.

By degrees the remedy has been applied in most of the great internal hæmorrhages, and it is now daily given in metrorrhagia, whether essential or symptomatic of various organic lesions. In all these it is very useful.

We can say as much for leucorrhœa, blennorrhagia at the period of decline, and a great many affections of the mucous membranes which are accompanied by bloody or mucous fluxes.

We have successfully used perchloride in certain cases of severe dysentery, at an advanced stage, when all ordinary means had entirely failed.

The perchloride has particular efficacy in purpura, whether of the variety simplex or hæmorrhagica.

A distinction is to be observed in regard to purpura simplex. Accord-

ing to M. Devergie, if it presents irregular plaques, diffused, always quite large, especially if its progress is continued and progressive, the perchloride rapidly cures it. If the spots are generally lenticular or petechial, quite circumscribed, and appear in successive crops, the case is otherwise, and the effect may be to shorten each attack a little; but it does not prevent relapses or further crops, and in fine exercises but a very slight influence upon the mode of development and the total duration of the disease.

In purpura hæmorrhagica, on the contrary, a deeper and more serious affection, characterized by hæmorrhages from various mucous surfaces, the perchloride possesses great power. In this respect the observations of M. Pize of Montélimart, and a certain number of other practitioners, seem very conclusive.

Yet it would be a grave mistake to attribute infallibility to the remedy, on account of its successes. For the disease, though putting on the same form, may have radical differences; and further, it often gets well with marvellous rapidity, whether a certain treatment be followed or no; and often, on the contrary, it goes straight on to a fatal end. We require no facts to show the inefficacy of the pretended specific in these refractory cases.

Being a martial preparation, the perchloride naturally has some use in the treatment of anæmia and chlorosis. At the close of the last century, it was combined with Hoffmann's solution, and enjoyed, under the name of Bestuchef's tincture, a great reputation, being thought to work wonderful cures, as a tonic and antispasmodic. Recent trials have shown the efficacy of the preparations of perchloride of iron in affections marked by impoverishment of the blood. In its double form of reconstituent and astringent it seems to me that it ought to find a special indication in menorrhagic chlorosis. Thus it will prove of special use to a certain number of young girls just beginning to menstruate, in whom the first periods are real hæmorrhages.

Under these conditions, we have more than once had occasion to observe good results from the employment of the solution, during the hæmorrhagic crisis, with cinchona powder in the intervals, as a means of rendering the new function regular at its outset, and of preventing subsequent fresh accidents.

We have now to speak of the use of perchloride of iron in diphtheria. On account of the special interest of this question, we shall dwell upon it at some length.

Dr. Aubrun is entitled to all the credit of originating this treatment. Our respected confrère, thanks to the skill and perseverance with which he has pursued his course of experiments, has developed a complete new method of treatment in croupous angina, which may have its future.

The method is as follows:

If diphtheria of the pharynx exists from the outset, we begin by touching the back of the throat with a sponge dipt in an aqueous solution

of perchloride of iron of various strength. The liquor of Dr. Rodet may deserve preference. The operation is immediately followed by increased ease of breathing, due to removal of the false membranes from the pharynx; and at the same time it acts as an alterative upon the affected parts. It will be necessary to repeat this several times, according to the severity of the local affection, and especially, according to the ease with which the false membranes are detached.

Contrary to general opinion and practice, M. Aubrun assigns only a very secondary place to topical applications, and hardly insists on their use; but we cannot share this view, which is too exclusive. He considers that all, or nearly all the treatment consists in the internal use of perchloride of iron.

He attaches great importance to the method of administration. If the patient is a child, 20 drops of perchloride liquid at 30° are placed in a glass of cold water. Of this, the patient drinks a swallow (about two teaspoonfuls) every five minutes while awake, and every quarter of an hour during the time of sleep. Immediately after each swallow, the child is made to swallow a mouthful of cold milk, not boiled, without sugar.

M. Aubrun advises that this treatment be continued with scrupulous regularity several days in succession, without pausing during sleep in the first three days, at least in very grave cases. His reason for this persistence is, that the false membranes do not usually begin to soften and fall off before the end of the third day.

It is necessary to take the precaution of giving the solution in a glass or porcelain cup, and not in a metal spoon or vessel, in order to prevent decomposition. It is also necessary to avoid all drinks, medicines or foods which might effect this decomposition, and more particularly those containing tannin. In fine, the treatment for the first four or five days is almost wholly confined to the solution of perchloride, which varies from 20 to 40 drops to the glass of water (according to the patient's age) and to cold milk. In general the patient takes, every 24 hours, from seven to ten glasses of the solution ($1\frac{1}{2}$—2 litres=3—4 pints), and nearly as much milk, making from 140 to 360 drops of the perchloride in 24 hours. M. Aubrun advises that the treatment be commenced as soon as possible after the outbreak of the diphtheritic affection, in order to arrest its progress more surely.

In support of this new treatment M. Aubrun presents the following results, all taken from his own practice:

During three years he has employed it upon 39 patients, of whom 35 were cured—2 with tracheotomy. The cases are classified as follows:

25	affected the pharynx from the outset	25	cures.
5	" pharynx and skin from the outset	5	"
9	" the pharynx and larynx; generalized; severe; — 3 from the outset	3	"
	6 at an advanced period	2	"
39		35	

The two last cures were obtained by tracheotomy (*Union médicale*, 22 décembre, 1860).

These are certainly most remarkable results, which must prepossess us in favor of the new system.

The same treatment has been used by others, both in Paris and the provinces, and several have had good results. We add that one of us very lately employed it very successfully in the case of a little girl, severely affected.

After M. Aubrun, we will specially cite M. Isnard of St. Amand, as having given most attention to the subject. In our opinion, this gentleman deserves the credit of having very clearly grasped and very judiciously estimated the mode of action of the perchloride.

M. Isnard sums up the action of perchloride of iron as follows:

1. Action on the blood, the fibrino-albuminous elements of which it renders more plastic, and prevents their transudation through the respiratory mucous membrane; or later, in infectious cases, through the walls of the uriniferous tubules, cutaneous wounds, the serous membranes, etc.

2. Action on the respiratory mucous membrane, the fibrino-albuminous elements of which it also renders more plastic, and contracts the organic frame-work. Thus the mucous membrane becomes incapable of being traversed by the albuminoid principles of the blood.

3. Tonic corroborant action upon the nervous system, the essential action in the view of most physicians; unquestionable, but of very secondary importance in the direct treatment of croup.

Resting upon the results which have been already gained, and perhaps still more upon the argument drawn from this triple influence, M. Isnard does not hesitate to consider perchloride of iron our hope in croup, and in some sort its specific cure. He explains, however, his view as to specificity. Perchloride of iron is not, he says, an anti-diphtheritic specific in the full acceptation of the term; but it prevents the intoxication. It does not destroy existing infection, but it arrests it in its increasing progress, and thus gives to the organism the faculty of reacting, of throwing off the toxic principle by its own forces and the natural emunctories (*Union médicale*, sept., 1859).

This interpretation is not quite complete, but seems to us rational and true; at least, it has the merit of giving the living organism its fair dues, in a special question of therapeutics where modern chemistry considers itself alone entitled to interfere, and vitalism quite out of court.

We should mention a similar attempt, previous to M. Aubrun's, in which the perchloride was used in a purely topical manner. We refer to the distinguished Dr. Jodin of Paris, who, having followed the studies of M. Bazaine on tinea, struck with the contagious property of the false membrane, asked himself whether the latter might not be wholly composed of a parasite.—He found spores and parasitic tubes in the false membrane of the throat and trachea; but, though the fact is correct, it is to be feared that the interpretation is wrong, for he himself candidly

states that he found the same parasites in the mouth, even when the patients were affected with other diseases. It follows that these spores are no more characteristic of the false membranes than thrush is of phthisis.

The useful point in Jodin's observations is, the great utility of local cauterization of the false membranes. It is only necessary, in order to make this effectual, to press upon the false membrane in order to saturate it well, and cauterize it in its entire depth.

This treatment has been since employed with success by Courty ("Recherches sur les conditions météorologiques et le traitement de la diphthérie," Montpellier, 1862), and by M. Leroi, of Château-du-Loir (*Union médicale*, 1860).

Very recently a naval surgeon, Dr. Noury, has confirmed these results by the cure of twelve out of thirteen patients with angina diphtheritica. He reports that Dr. Cuneo, at the port of Toulon, has more than 20 similar cures. These gentlemen carried the doses up to 10 grammes (154 grains) per day, even in a child of 5 years (Noury: *Thèse de Paris*, 1872, No. 62).

In fine, while acknowledging the first successes of the new treatment of diphtheria, we must leave to time the duty of giving final judgment.

Tonic Treatment in General.

We shall see alterative medicine hindering or destroying the action of the plastic force, opposing the reparative changes of living chemistry by weakening the nutritive properties of the blood and the tonicity of the solids. Tonic medication has an entirely different object; it restores the tonicity of the tissues, reconstitutes the assimilative functions, and imparts vital resistance to the system.

If we consider the organic actions directly affected, we shall soon find that they are the most important, the most radical in the system, and the basis of animal life. They are found in the lowest and simplest of animals, as complete, as perfect, as well marked in essential points, as in the highest animals, or even in man.

As observed in animals which consist of a formless parenchyma containing an alimentary sac without any other special organ, the actions here considered comprise essentially: 1, an areolar circulation which requires two conditions, viz.: an organizable, assimilable liquid, and a solid matter possessing a certain orgasm or tonicity, which enables it to react against the impression of the liquid, its normal excitant, so as to perform obscure movements in various ways (capillary or interstitial circulation); 2, identification of an assimilable liquid with the assimilant solid (nutrition); 3, the formation at the point of contact of these two elements, of a new product (secretion), which, not being further required as a part of the creature, is soon eliminated (excretion); 4, the production of a special temperature (calorification).

This extreme simplicity corresponds with the simplicity and homogeneity of the composition of these animals, which consist only of cells which are nearly alike. Living chemistry had few combinations to make in forming a single substance, the least animalized in the scale of tissues. This is why these animals contain no elaborating organs, viscera, for preparing the food and rendering it fit to repair the organized matter.

But in higher animals, mammals, and man especially, to whom all that we are now to say relates, the system of nutrition is infinitely complex.

In finishing the animal, nature has reached the highest degree of organic perfection, which consists in the summum of development of the organs which place it in relation with all other beings. The instruments of this "life of relation" are the cerebro-spinal system of nerves and the locomotor muscular system, both formed of the most composite and the most animalized tissues in general anatomy, albumin and fibrin.

"The animal lives for the nervous system," says a great naturalist. We shall deduce from this profound saying the fundamental principle which we think ought to guide the pathologist in the philosophic study of tonic medicine.

In man, a series of instruments or organs called viscera (from vescor, I am nourished) stands between the food and the organized matter, the function of which is to give to the food a series of modifications which assimilate it to the substances which it is to form or support. Another series of organs has the object of elaborating, not reparative substances, but the unassimilable parts of food, and the substances which, used by organic movement, and super-animalized, are to be rejected. Thus, between the ingesta and the fixed animal matter, there is a series of assimilant or composing organs; between the fixed matter and the excrements, a series of depurative, disassimilant, decomposant, excretory organs. This constitutes the nutritive system, the organic life, in man. This complexity is necessary, in order that the alimentary material may pass gradually into a state of animalization such that they may replace the various components of the human body. In the last analysis, all these preparatory operations of vital chemistry, acting through the viscera of assimilation and disassimilation, do nothing but prepare the formation of the organs of the life of relation, to wit, the cerebro-spinal nervous system and the muscular system which is subject to it.

But a spinal nervous system is required to animate all these organs and co-ordinate their functions. These functions seek one end by various means; they require an influence to distribute to them such degree of sensibility as may place them in connection with their special stimulus, and may cause in them the movements necessary for transporting nutritive and effete materials; an influence which may insure the unity and regularity of the operations, and which, establishing a correspondence with the sensible centre, the brain, may inform the animal of his needs, and urge him by irresistible instincts to procure food. This nervous system is called the great sympathetic or trisplanchnic.

Three chief things are to be considered in the nutritive system of man, which is called by Bichat the organic, interior, or hidden life of man. These three are of much importance in relation to tonic medicine, and are:

1. The fixed and solid animal matter, organic tissues, parenchyma, etc.; 2, the liquid animal matter from which the solids draw all the elements of their development, maintenance, and repair; 3, the nervous system which animates and co-ordinates the functions of the viscera which form blood and remove the residual and effete matters.

Let us apply these physiological facts to the study of tonic medication.

1. We have seen that the organic tissues, in order to receive the impression of the nutritive fluids circulating in their interstices, need a certain power which shall enable them to react on these fluids and give them the oscillatory movements which constitute the areolar or capillary circulation, and shall also give them a vital affinity for the circulating fluid, to enable them to borrow from it the molecules needed for its sustenance; that is, a power of assimilating the fluid.

This important faculty has always fixed the attention of physiologists. Stahl, who was greatly interested in it, gave to it the government of many physiological and pathological acts which do not belong to it; he called it tonicity or tonic movement (from τόνος, tone, tension, rigidity). "Motus vitales æque parte animales uti ante omnia supponunt sufficiens robur in ipsa parte, quod, quia in certa tensione consistit, propterea tonum appellare soleo, et maximo merito MOTUM TONICUM" (Stahl: "Theor. med. ver.," p. 647). Bichat, decomposing the properties of this force, gives it the double name of organic sensibility and insensible organic contractility. Lamarck ("Philosoph. zoolog.") speaks long and very well of it, denoting it by the word orgasm, which in fact seems to us very exact. Broussais ("Physiol. appl. à la pathol.") calls it vital erection, and his study has given him material for admirable developments.

Recent biological experiments (which throw so great a light on all which concerns physiology, and even pathology) have shown by the labors of Prochaska, Legallois, Marshall Hall, Joh. Müller, Claude Bernard, etc., that this tonic action originates in the sensitive nervous terminations, passes to the medulla, and returns thence to the same or another point as a motor excitation, whence the epithet reflex is given to this action.

The anatomical base of this act was discovered, in 1853, by Schroeder van der Kolk, at Utrecht, and Wagner, at Göttingen. The posterior roots of the spinal cord furnish one group of ascending fibres which go to the encephalon, a second which loses itself in the posterior cornu, and a third which passes from behind forward through the entire thickness of the cord and goes to the groups of large motor cells, and thence to the motor nerves (Jaccoud: "Les paraplégies et l'ataxie du mouvement," 1864).

M. Claude Bernard has further shown that the excito-motor arc does not necessarily pass through the cord, and that a ganglion of the great sympathetic may serve as a centre of reflex action. He has demonstrated this upon the submaxillary gland.

This established, let us add that certain very grave morbid conditions are specially characterized by a loss or considerable enfeeblement of this faculty, a sensible relaxation of the tonicity of the living tissues; the sensibility and the insensible contraction of the parenchyma—to use the words of Bichat—are so languid and lose so far their affinity for the blood and other liquids, their normal stimulus, that the affinities of vital chemistry are no longer set in action. In these affections the capillary circulation is slow and imperfect, and the liquids are as much under the control of gravity as of contractility. They escape through the exhalants, transude by the pores, spread over the surfaces, or are extravasated in the cellular cavities, etc. These accidents are the predominant ones; their indications are the most pressing, often the only ones. There is a class of tonic agents suited to combat these accidents and fulfil these indications; these are the tonics, properly so called, in the strict etymological sense (τόνος, tension).

Some writers on materia medica exclude these from the general class of tonics, and place them apart as astringents. We prefer to follow Cullen and others, who place them among tonics, under the name of astringent tonics.

Thus, tonics in general are divided, firstly, into astringent tonics, which give to the solids, directly, the tone, orgasm, vital density, needful for the performance of their insensible actions.

2. The blood, the internal source of supply whence the solids draw all the elements of development, sustenance and repair, in order to possess these qualities, must convey a sufficiency of nutritive particles, of liquid flesh, in a word, of fibrin, albumin, globules, etc. There are diseases specially characterized by an insufficiency of the elements, which give rise to a great variety of the severest symptoms. The most important indication is to restore to the blood its nutritive qualities as soon as possible. The remedies which effect this are called analeptic or reconstituent tonics (from ἀναλαμβάνω, I re-establish).

The second division, then, consists of analeptic tonics, characterized by restoring immediately to the blood the organizable and reparative principles which are lacking.

3. Lastly, the nervous system which animates and co-ordinates the functions of the viscera which form the blood, remove residuary and effete matters, and preside over generation, the ganglionic system, in order to perform those important functions, needs energetic, persistent, active, constant and profound energy, and especially, perfect harmony of action. This system governs the phenomena of animalism. It regulates all the instincts, all the phenomena of vital synergy, of general reaction, of the vis medicatrix, of physiological resistance—in a word, all those great phenomena on which rest health and the symptoms in disease. The principal centres of this apparatus are what has been designated by turns the ἔνορμον, the duumvirate, the archæus, the impetum faciens, the vital tripod, etc.

Every considerable disease has its echo in this system. It is usually

affected indirectly. In certain cases it is attacked partially and primarily; with these we have not to deal. But certain other causes strike directly the chief foci of this system, and tend to extinguish organic life in its animating centres. Then we see all the great functions of the economy fall into sudden collapse and incoherence; strength and harmony are broken, the synergies impotent, vital resistance blasted, the principle of existence directly threatened. These are the malignant, pernicious maladies, etc. We then need, to save the life which is ready to flee, heroic remedies, which do not require to excite one or several physiological modifications before their effect is produced, but go straight to the point of danger, attack the enemy body to body, as Galen says, and throw him violently; or rather, which resist with energy, and support the nervous system in its reaction against the fatal influence of certain causes or morbid germs. The last class of tonics includes these potent antagonists, which we will name neurosthenic tonics.

The third division, therefore, consists of neurosthenic tonics, characterized by conferring vital resistance immediately upon the living forces of the animal system, and by re-establishing its synergies.

Independently of these special and distinct effects, the above classes of remedies have a tonic action in common, resulting from their usual mode of administration. All of them, when placed in the stomach, are stomachics, excepting some of the first class; and the restoration of digestive power, insuring good material for repair, is certainly a leading and very powerful sort of tonic action. And who does not know that the physiological influence of a stomach, which is happily at work, pacifies and consoles the whole system, giving a proof that force and harmony are there, "pylorus rector" (Van Helmont)?

The study of remedies has two parts: 1, that of the physiological or immediate action of a class of remedies; 2, that of the indications or contra-indications for producing this action in given diseases.

We will resume the study of tonic medication in general upon this plan.

Physiological or immediate action of tonics.—In order to understand the immediate effects of a remedy they must be observed in a person in a state of perfect health, whose organs are all in equilibrium and possess their vital reaction. If we recall what was just said, and define tonics in general as remedies capable of restoring energy to the functions of organic life directly and immediately, we shall soon see that they do not possess a physiological action differing from their therapeutic one. Observe, also, that we do not say that they give, but that they restore energy to these functions. How could energy be given to the nutritive functions of a man who lacks no energy? In order that the effect of tonics should be marked, the function must first be feeble and stand in need of restoration.

Properly speaking, there will be no physiological action. Let us explain. A mustard foot-bath is prescribed in active congestion of the

brain. The redness, pain, congestion, in a word, irritation of the feet, form the physiological action of the bath. If the congestion of the head is arrested by the effect of the mustard, that is, by the revulsive irritation of the limbs, the therapeutic aim is attained. It is very important to note the distinction between the two, for the former may easily exist, and unhappily does often exist, without the latter: whence the great uncertainty of therapeutics. When a remedy possesses all its physical and chemical properties, is in good condition, is given in fit doses, we generally get from it the physiological action of which it is capable. It is far from being so with the remote, mediate, or therapeutic action. The curative effect is always preceded by a vital action kept up by the remedy, to which we apply the name of immediate or physiological effect.

This effect sometimes appears in other organs than those which require to be affected, and it then appears distinct from the remote or therapeutical effect. At other times the remedy has its special influence directly upon the vital acts which are aimed at; in this case the immediate or physiological action seems to be confounded with the remote or curative effect. But in reality the two orders of effects always exist, and the second, the one desired, is always indirect, that is, the product of life modified by the remedy. There exist no specifics in the sense of the Galenists and of humoral medicine. The medicine either acts on the affected organ, and is direct, or upon a different one, and is indirect. In both cases the malady is never modified except by the intervention of a physiological action.

To this, finally, does the division into rational and specific treatment come, which, we repeat, is only a Galenic subtlety.

All writers on materia medica have assigned to tonics the character of acting insensibly, gradually, and of imparting to the vitality of the organs a durable energy. Upon this fact they base the distinction between tonics and stimulants; the latter acting promptly, vigorously, and with an evident vital exaltation, which is unmistakable, though very transient. These facts are a proper basis for drawing a natural distinction, but we may go further, and ask for the reasons for this difference.

Several illustrious physicians of the school of Montpellier, Barthez and Dumas in particular, have admitted two species of forces in the system—the acting forces, in actu, and the radical forces, or in posse, a distinction already pointed out by Galen.

Since an understanding of this distinction is indispensable in order to grasp the action of the most important tonics, we shall leave to Barthez himself the task of stating it; we shall develop it when applying it to special classes of cases.

"We ought not to regard the system of the forces of the vital principle as we do those of the mechanic forces. This error produces an infinity of others, in the science of man and in practical medicine.

"A system of mechanical forces includes only determined forces which act at a given time to produce equilibrium or sensible motion.

"But among the forces of the vital principle we must distinguish the forces which this principle causes to act at each moment in all the organs, from the radical forces, or those which have the power to sustain the acting forces in their task.

"The aggregate of the sums of these two sorts of forces forms that which I call the entire system of the forces of the vital principle.

"No doubt it is hard for us, with our mechanical notions, to imagine a sort of forces which are absolutely radical or potential.

"But in support of this distinction, which I am the first to propose, I remark that it has always been presupposed, although in an implicit and extremely vague way, since it has always been said to be very desirable in medicine to distinguish the oppression from the resolution of forces.

"We can form no idea of the latter distinction except as we suppose that radical forces exist, which are either merely oppressed, or are resolved (destroyed) in the various cases of enfeeblement of acting force.

"The forces acting in the organs originate in the radical forces, which are distributed to each organ in accordance with unknown primordial causes, or with causes extrinsic to the living body, which act in a manner only known to us by observation.

The primitive energy of the radical forces is doubtless different in each man from birth, and is susceptible of continual increase and decrease.

"The increment is effected directly by the action of various fortifying agents which may bear immediately upon these forces. Some fortifying agents, such, for instance, as cinchona, may naturally increase the radical force of the vital principle directly; and poisons may, equally naturally, attack and destroy directly these radical forces.

"But the increments of radical force, which are indirectly produced by an exercise of the function which is conformable to health, are of principal importance. They always exist in a ratio compounded of the intensity of action displayed by the acting forces in each of the principal functions, and of the preservation of the balance of activity among the functions, which habit has established in that form of health which is peculiar to each individual" (Barthez: "Nouv. élém. de la sc. de l'h.," t. II., p. 163 et seq.).

The true tonics, which directly restore the functions of vegetative life and impart vital resistance to the nervous system, bring their influence to bear, immediately, either on the radical forces to increase them, or on the acting forces to fix them and increase their resistance and vigor. To use an expression, of which the energy, conciseness and picturesque vigor betray its source, they make force, they fix the state of the body, "vim porro habent hæc medicamenta ut epotis his CORPUS IN LOCO SIT" (Hippocr.: "De affect.").

It is then quite plain that they can have no action upon the healthy and robust man, which can enable us to prejudge their therapeutic effects. The tonics we are now considering are those of the second and third

class, the analeptics and the neurosthenics. The former build up the blood directly, the latter by directly imparting vital resistance to the animal frame. A man in full vigor of function will not be built up by analeptics, because his blood is already rich. He cannot go further without endangering it, nor recede without impairing the assimilative force which is in its highest condition of activity. This has been well expressed by the immortal author of the Aphorisms as follows: "In gymnasticæ disciplinæ deditis, boni habitus ad summum progressi periculosi, si in extremo steterint; non enim possunt in eodem statu manere neque quiscere. Quum vero non quiescant, neque ultra possint in melius proficere, reliquum est ut in deterius ruant. Horum igitur causa, bonum habitum solvere confert haud cunctanter, quo rursus nutritionis principium sumat corpus, etc., etc." (Hipp.: "Aphor.," sect. i., aph. 3).

If we give to this vigorous man the analeptic tonics, including preparations of iron, the broths and gravy of dark meat, fibrin, osmazome, and all the substances which are strongly nitrogenous, and if he takes no food except these, combined with preparations of iron, he will soon be plagued with symptoms of plethora; then in succession, with indigestion, with phlegmasias, hæmorrhages, excessive diminution of all the secretions and exhalations, gravel, gout, then debility, obliteration of the intellectual, sensory and motor faculties, and lastly, indirectly, remotely, colliquation and marasmus, etc. The physiological effects of such remedies require, in order to become therapeutic effects, to be developed in persons of weakened assimilative power, or whose blood has lost part of its reparatory elements; for in well and strong persons these physiological or immediate effects, far from benefiting health, would only beget morbid symptoms. So true is it that a rigorous classification of medicines is impossible, and that, according to the dose and the condition of the subjects, they possess different, and sometimes opposite properties.

If possible, the neurosthenic tonics are still more destitute of a physiological action in health which could lead us to infer their action in disease. This is evident as soon as we name them—the bitters, and cinchona at their head. To display their power they must attack a disease or an enervated organism. How can they impart vital resistance, where this faculty is not impaired? But give them to persons in whom this resistance is weakened, threatened, whose synergies are broken, discordant, and we shall see how surely and promptly the organism will rise and resist the morbid influence.

As to the astringent tonics, they form an exception to these laws. They always act through tangible physiological phenomena, producible on health, independently of those changes in fibrillar tonicity which form the object of their beneficial action. They are, therefore, rather tonics in the etymological than in the medical acceptation of the word. We have classed them with tonics for this reason, and also because they may fulfil special indications in reconstituent medicine, and thus become true tonics.

We think that they may act on that which Bichat calls the properties of the tissues, as distinct from vital properties, because they persist after death. The astringent tonics may exhibit their corroborant and tanning action upon tissues deprived of life. It is thus that they are useful, and affect immediately the vitality of such tissues.

The tonic influence exercised by these three classes, especially the irons and the bitters, through their stomachic action, is obtained by physiological effects, which may to some extent be seen in a well person. In such a subject, the appetite and digestion may be excited and accelerated, but the appetite will soon fail, and digestion become painful and disturbed. When given to fulfil good indications, and solely to relieve the digestive functions, their effect will be more pronounced and beneficial. In spite of the assertions of some authors, their stomachic virtues play but a feeble part when they are required to aid in directly restoring the blood, or to uphold by an instant support the vital resistance which is on the point of sinking.

The distinction between tonics and excitants is now clearer.

Stimulants give more energetic play, they increase and expend the forces actually (in actu) at the disposal of the system. Tonics increase, raise, repair the forces which the system may use—the radical forces. The former have a very manifest and constant action independent of morbid states, because the system may always hasten the expenditure of its acting forces, and exhaust the vital movement; but it is impossible for a man to increase the sum of his vital forces when they have all the physiological power which his constitution admits of. The more vigorous and healthy a constitution is, the more will stimulants act on it; the more food for excitement will it be able to furnish. On the contrary, the more vigorous and healthy an organism, the less capable of an increase of radical force through the action of tonics, which are only able to repair where loss exists.

The promptitude, vivacity, and briefness of the stimulant action, compared with the insensible slowness, the silence and permanence of the tonic, are an obvious consequence of what we said at the beginning of this section upon the obscure tonic movements of the tissues, the radical forces of the system, and the vital resistance of the nervous system.

The physiological stimulants of the acting forces are constantly producing a loss of radical force, which has to be repaired by the physiological tonics. These stimulants consist of motion, exercise; the waking state, and all the locomotive, intellectual and affective acts which fill it; the physiological tonics are food, sleep, rest of the organs, and that conservation, of which Barthez speaks, of the balance of activity among the functions, which habit has established in the form of health which is peculiar to each individual.

But in extra-physiological states, in certain diseases, the reactions of the acting forces sometimes require to be called out, or sustained, while

physiological stimulants are no longer suitable. Therapeutical stimuli are then in order. We shall speak of them in another place.

In other morbid states, the radical forces require to be fixed or brought back to their normal energy or resistance, and the use of physiological tonics is unsuited to the circumstances. Then it is that therapeutical tonics are of use.

Having now studied abstractly each of the forces which combine for nutrition, we ought to add that these three are solidary, inseparable, and in reality cannot act nor be modified independently of one another. They do not rationally exist except in concurrence. One of them supposes the other two, represents them in its way, and necessarily includes something of them. This is why every hygienic or therapeutic modifier acts, not solely on the specially correspondent force, but on all three forces. It acts, however, on the others only indirectly and by means of the force with which it is most directly related. It follows that when we say that iron acts on the vascular system as a direct inciter of hæmatosis, cinchona on the nervous matter of organic life as a radical fortifier, rhatany on the framework of tissues as a primitive tonic and roborant, we do not exclude the indirect actions which these remedies may have, the one on the nervous matter and the organic framework, the second on the framework and hæmatosis, the third on the latter and on the nervous tissue. Just as these three elements mutually interpenetrate, to form an indivisible unity of organism, so the three tonic properties are intimately combined in each of the three groups of remedies; only, each group bears the name of its leading quality. Iron has distinct astringent and neurosthenic properties, but the former are less marked than those of alum or rhatany, and the latter less certain than those of cinchona. Catechu is an astringent, and a stomachic or neurosthenic of the stomach. And cinchona, quassia, etc., are plainly roborants or tonics to the tissues.

It is understood that these generic analogies permit each species of the genus, each individual of the species, to possess its own individuality.

Thus, in spite of their analogies, iron and cinchona are mutually distinct. Both are tonics, each in its own way.

Analeptic or Reconstituent Tonics.

This first category includes only iron, and perhaps manganese, according to the recent studies of M. Pétrequin of Lyons. Certain substances, as fibrin of dark meat, broths, raw flesh, maltine, pepsine, and proteine, might be added, as containing a great amount of analeptic principle in a small bulk, and as being the most restorative of all alimentary substances. For these properties they are often prescribed as remedies, not only to nourish and repair the body, but to combat a certain order of morbid phenomena. They are thus the most potent succedanea and the best

adjuvants of the action of iron, the only analeptic tonic in the materia medica.

The blood must be impoverished in order to derive benefit from iron. Many and various are the diseases which give rise to this state. In our time they are often not recognized unless they are so well marked that it would be impossible to mistake them. But these are not the only cases in which a multitude of functional lesions spring from lack of energy and proportion among the assimilative functions, and in which the leading indication is to increase their activity by analeptic tonics. We shall here discuss some points of physiology and pathology which are necessary in order to appreciate the indications for these remedies.

There is, perhaps, in physiology, general pathology, practical medicine, no greater and more fruitful fact than one which is found in several places in Hippocrates, to which the great man returns with a satisfaction which shows how wide a place he assigned to it. What breadth in the simple words, SANGUIS MODERATOR NERVORUM! How directly does it bear its fruits, when Hippocrates deduces that inference, so true and so broad, that it is hard to say which of the two, the inference or the former observation, is the principle, and which the application—FEBRIS SPASMOS SOLVIT. It is the same law interpreting other facts, when he states that the blood is a soporific, "sanguis somniferus;" that it gives wisdom (*i. e.*, harmony, connection, solidity of intellect and morals), especially when it has its normal density, "sanguis ad sapientiam facit præsertim quum suam habet consuetam concretionem;" that on the contrary, when too liquid, it produces unreason, "sanguis ad insaniam facit quum sit nimis dissolutus," etc.

These capital propositions govern a whole class of affections of the nerves, as we shall see.

Is not this something most worthy of the meditation of physiologists and the attention of practitioners, this perpetual antagonism between blood and nerves, between the predominance of the assimilative and that of the nervous phenomena; giving rise to the fact that, the more development and activity the sanguineous system and the plastic force possess, the more fixed, silent, regular, co-ordinate are the nervous acts; that, conversely, the more poor and feeble are the nutritive and vegetative functions, the more blood is diminished in quantity and despoiled of its organizable parts, the more mobile, exalted, irregular, are also the nervous forces? The silence of the nervous phenomena shows no weakness, for force and power arise from harmony. Exaltation and mobility are anything but tokens of force, for throughout the organism, weakness arises from disorder and want of harmony.

The simplest observation of man in health and disease affords abundant attestation of the truth of this law, laid down by Hippocrates for the first time, and one might say for the last, if Sydenham had not found the facts on which it rests in nature, rather than in the works of the Father of Medicine. These facts were his torch in that little treatise on hysteri-

cal disorders, which forms part of his letter written to William Cole (Sydenham: "Op. Méd.," tom. I., p. 266), an admirable masterpiece of observation and practical medicine, which, in spite of the opinion of an excellent writer (Dubois of Amiens: "Hist. philos. de l'hypocond. et de l'hystér.," p. 370), we regard as constituting one of the best titles to his glory. We are proud of being the first to resume these ideas since Hippocrates and Sydenham. On the subject of antispasmodic treatment, we have taken them as our guide in laying down the radical treatment of essential diseases of the nerves, of which the antispasmodics were but palliatives. It is time to give currency to ideas too much neglected, which, we venture to say, form the secret of treating many spasmodic affections and neuroses.

Ars, imitatio naturæ.—Upon this principle rests Hippocratic medicine. Our task should be to learn how nature departs from her physiological state, on what essential conditions this state depended while it was maintained; then, by what paths, by the aid of what circumstances nature returns to order and equilibrium. If, after this, we find that in cases where nature cannot restore herself, art or therapeutics can, by imitation, do that which the organism in other cases can do of itself, we shall have shown the true sources of the curative indication in an important class of diseases.

There is an ancient division of the organic functions into the vital, comprising respiration and circulation, because these functions are vital par excellence, and immediately necessary to life; and the natural, comprising digestion with its adjuvant acts, and generation, because nature has placed in animals invincible instincts which lead to the maintenance of life and the propagation of the race. There is a nervous system which presides over these, and which co-ordinates their functions and those of animal life. We stated the attributes of the trisplanchnic system at the beginning of this section. We now add the physiological consequences of these attributes, a subject to be resumed under Antispasmodic Medication.

The leading characteristics of the great sympathetic nerve are: 1. Incessant continuity of action; the functions of life are directly under its keeping, and if it suspended its action life could not be maintained for an instant. 2. Complete silence in action, dumb concentrated activity entirely without the cerebral consciousness. The more regular, energetic and salutary this action is, the more it ought to be remote from consciousness; this is the stamp of robust and complete health. 3. Power to force and subdue the will invincibly, to control the locomotor system and all the apparatus of relation by making the brain its own servant or agent; a capital fact, forming the domain of instinct and the passions. 4. Nullity of cerebral influence upon the phenomena which are wholly dependent on the action of this system.

Recall, now, that whatever leads the trisplanchnic system from the performance of its due functions, produces what is called nervous disease—

nervousness, spasms. We shall speak further of these under Antispasmodic Medication.

The conditions which give rise to the nervous state may be classed under two general heads: 1. Causes which strike the ganglionic system directly, and, so to speak, snatch from it its natural functions. Among these, in the first place, are the passions, the strong affections of the mind; next, certain morbific principles like that of gout or rheumatism, etc. We have nothing to do with this class. 2. Causes which affect the ganglionic system indirectly, removing it from its duties by removing the object of its activity, to wit, the food or the blood. The visceral innervation, having then no object, unable to use its activity in a normal and regular way, excites a thousand disturbances consisting of morbid sensations, vicious and disorderly movements. This class is more powerful and more fruitful; we shall dwell on it, as furnishing the most important indications for analeptic tonics.

We will give some familiar examples to show how the nervous condition is developed as assimilation is weakened: first, by sudden abstraction *en masse;* second, by slow and gradual abstraction.

Anæmia.—Observe a woman surprised by an abundant and fatal hæmorrhage. In a few moments the heart will beat more quickly; soon irregularly. This is a commencement of spasm. Anxiety at the epigastrium, nausea, fainting, soon appear. The stomach throws off all its contents. A gaseous secretion distends the intestines, their vermicular movement is exaggerated, they move in various directions. The least emotion agitates, produces unbounded effects. The slightest impression produces lively emotion. Tears flow without motive. Respiration is thoracic and frequent, or slow and sighing, often interrupted by deep yawns. The eyes soon roll up, a sensation of strangulation is felt, the neck and arms are twisted, the trunk stretches itself convulsively, the legs are flexed, and an hysterical or epileptiform attack occurs. If the bleeding keeps on, the above symptoms increase in intensity, the convulsive attacks become more frequent, and often at a moment when the loss of a few drops more will produce certain death, the convulsions are at their height; their energy is frightful; then comes a general and sudden check, the icy calm of which is interrupted only by a few twitchings. The jaws set, the face grimaces; then, after one last deep breath, the woman expires.

To the observer, this picture affords a profound lesson in therapeutics.

But the warm and palpitating corpse contains other lessons.—If you cut an animal's throat, and remove the heart and entrails suddenly, the heart beats outside of the chest, the entrails contract—beat both in vacuo and without reason, if we may so say. These phenomena constitute spasm, taken in the act, unveiled in all its truth; for we cannot better describe and define spasms and neuroses than by saying that they are useless sensations and movements, without aim or destination.

It is evident from these first examples that the rapid removal of blood causes in the nervous system of organic life an unusual, irregular action,

illegitimate and aimless movements, and thus becomes the most efficient cause of maladies of the nerves, neuroses.

If the relation of cause and effect were always as plain and striking as in the case just delineated, every one would be convinced. But when the cause is not before our eyes, in material and irrefutable form, when the only effects appear under forms more or less insidious and simulating diseases of another sort, then it is harder to assign them to a common and genuine cause; then occur the worst therapeutic blunders, especially since the reign of physiological medicine and of the school of anatomical pathology.

But, though less evident, the physiological cause is not essentially different, and the therapeutic indications also remain the same, in the absence of specific agents able to destroy the morbid principle directly.

To prove this, let us now take cases of less marked features; let us observe these features in still more obscure cases, where induction and analogy must be invoked; and lastly, in cases where the only touchstone is found in the effects of tentative treatment, as if to give a striking application of the Hippocratic axiom: "Morborum naturam curationes ostendunt." By thus passing from simple to complex, from the incontestable to the less apparent, and observing the impossibility of drawing a line of separation, we shall succeed in throwing light and bringing persuasion.

Nothing is more common than for women whose menses are excessive in quantity, or return several times a month, to be tormented with vapors and nervous troubles. The digestion is soon affected; the nutritive functions disturbed; the crasis of the blood is weakened, and menorrhagia increased; and from this indefinite aggravation of cause by effect results a dilapidation and a disorder, a functional perversion and a radical debility, from which it is hard to disentangle the true indications for treatment. What adds to the doubt and confusion is that some secondary symptoms are almost always so prominent as to attract the chief part of the attention, and form the basis of diagnosis. The stomach and its functions very often furnish such. The gastralgia and constipation are here only symptomatic of anæmia.

The nervous condition of women, due to habitual hæmorrhages, is no more to our present purpose than that due to other similar causes. We give it, however, the first place, both for its importance and for the influence its solution ought to have upon practice.

When the system is suddenly deprived of a large quantity of blood, the animal functions are the first to suffer. The brain, the senses, the locomotor system, are the first to announce the insurrection of the nervous system. Then, if the subject survives, and blood is not soon restored in quantity and quality, various functional lesions of the abdominal and thoracic viscera soon appear. But if the assimilative faculty has been slowly despoiled of its material, as in the case of menorrhagia, and particularly if the despoiling has been a slow process, by untimely and

prolonged dieting, chlorosis, cachexia from intermittent fevers, or other conditions of which we will speak below, the first functional troubles are in the stomach and heart.

If in this case the latter organs give the first sign of the spasmodic condition, need we be surprised? Have we not pointed out, as a characteristic of trisplanchnic innervation, the necessity of continual action; and in that state of perfect equilibrium which constitutes health, have we not noted the silence, the obscurity, the latent action of these forces, and the absolute ignorance in which the brain ought to rest in respect to these vital operations? The nervous action which regulates these operations cannot cease without putting an end to life; hence it goes on, in spite of the insufficiency of the reparatory material which it has to work upon. But as soon as it ceases to be absorbed and regulated by the operations preparatory to nutrition, it gives rise to all sorts of pathological phenomena, which, perceived by the sensory centre, constitute those abnormal (that is, useless and objectless) sensations and motions which are called spasms and neuroses.

The stomach, or rather the solar plexus—the sensorium commune of the vital sense, as Grimaud elegantly conceives—is the focus whence the greatest number of spasms, pains, functional troubles arise. This centre is to the vital and natural functions that which the brain is to those of relation. Its office, so to speak, is to sum up and express the discomfort and suffering of the other viscera. Thus, it gives rise to the normal sensation of hunger, and transmits to the brain the sense of this essential need—a need not confined to one organ, but which only one has the privilege of stating. This viscus, then, whose acts ought always to be unknown to the ego, is the first to experience erethism when the system is suffering a famine of reparative material. The word erethism needs a definition; it is employed by most people to express irritation, orgasm, excitement, excess of action, force, etc.

Erethism is the morbid susceptibility of an organ due to privation or insufficiency of these physiological or natural stimuli. It is the most certain sign of weakness. The physiological stimulus of the stomach is food; that of the whole system, and the circulation of the heart in particular, is the blood.

An unsuitable diet puts the stomach in a condition of erethism. If you add anæmia, the whole economy shares in the erethism. The epigastric centre also, as the sensorium commune of the vital sense, will feel and reflect the general suffering, and there is no sort of abnormal and painful sensation of which it may not be the seat. If, as is usual, the chief symptoms are pain in the epigastrium increased by pressure, weight, cramps, and discomfort of the stomach after eating; still more if there are also palpitations, headache, oppression; still more, if heat, burning irritation, is felt, with eructations of gas and food, etc., you may be sure that the word gastritis will be uttered; the words leeches, diet, mucilage, milk diet, chicken broth, etc., will follow, as the shadow follows the body.

And what then? The unhappy woman (it is almost always a woman), relieved for a moment, is soon plagued with general troubles and local irritation worse than the former; even milk begins to disagree, because it is a law of erethism that the greater is the loss of normal stimulus, the more does the weakness and the susceptibility increase; the slightest pressure on the epigastrium may produce convulsions, tears, or loss of consciousness. All this will confirm the diagnosis; the gastritis is thought to be making progress in spite of the antiphlogistic treatment; a new indication is thought to be found in this circumstance for renewed activity of treatment—and so on for years, as we, unhappily, have too often seen.

A gastritis, sufficiently intense to produce the pain and other symptoms of the erethism or the neurosis we are describing, would not last many days without disorganizing the mucous coat of the stomach, producing peritonitis, etc.; but the state we are describing has no influence of itself upon nutrition, and is never dangerous to life of itself.

On the other hand, we have for a very long time been seeking in the hospitals and elsewhere for spontaneous, acute, frank gastritis; but up to this time we have reached no other result but this, that the disease is, for us, a chimera, a creature of fancy. We have observed acute gastritis produced by the contact or ingestion of poisonous substances, acids, concentrated alkalies, alcohol, etc., and that which follows indigestion or a too stimulant meal, and is cured by two or three days of abstinence; but we repeat it, never, except under the preceding conditions of causation, have we recognized a disease consisting solely and primitively in acute inflammation of the gastric mucous membrane. The only acute gastritis observed, except in poisoning by irritating substances, is that which might be called gastritis crapulosa (gastritis a crapula of some nosologists), to which scarcely any but men are subject; while we have observed that women are more specially liable to gastric neuroses, which are so commonly taken for phlegmasiæ.

We need not pursue the differential diagnosis.—But we will add that it is well to distrust excessive sensibility under pressure in the epigastrium. This exquisite sensibility is scarcely a property of pure gastritis. When closely questioned, women will admit that it has no analogy to the pain produced by pressing an inflamed part. It is rather a painful anxiety, a spasm, an indefinable malaise, than an organic pain properly so called. The pressure causes a sense of oppression, of cardialgia, of collapse, quite like that which attacks the same region under the sudden influence of a painful emotion, a surprise, a severe fright, etc.; and furthermore, there is another affection of the stomach which is observed independently of this state of erethism, and which causes horrible epigastric pains, namely, gastralgia—which, also, is not a gastritis. Many persons in perfect health of stomach cannot stand the lightest pressure on the epigastrium without severe pain.

The state of which we speak very rarely causes vomiting, while acute

gastritis is always accompanied by it.—It has been repeatedly stated of late by sceptical and minute observers, on the faith of necropsies and facts which seem most exact, that the state of the tongue has no connection with that of the stomach; inflammation of this organ is no more indicated than that of any other, by redness and dryness of the tongue. This notable error has been one of the chief causes that have prevented physicians from giving up their blindness. In the cases we speak of the tongue is moist, red, large; it has all the signs of health, except that, in many cases, its papillæ are excessively developed. Or they may be only salient, and grouped towards the tip of the tongue, bright red, and deprived of skin as it were, in which case they show, if not a proper gastritis, at least a shade of vascular irritation of the mucous membrane of the stomach added to its nervous irritation, and the physician should always keep this complication in mind. Or the tongue is red, not lanceolate, the papillæ not inflamed, but erected and pressed together like the pile of woollen velvet, occupying the whole surface of the organ; then the affection of the stomach is purely nervous—gastralgia, or dyspepsia with erethism of the organ.

The sensation of heat, burning, irritation, in the absence of other signs, has no value as a characteristic of gastritis. When the innervation of an organ is deranged, it may produce, as if by hallucination, sensations which in health result only from fixed causes; and this, in the absence of of any material cause, any added stimulus, any organic lesion. The skin itches and burns without any visible cause; the stomach gives the sense of hunger and satiety, independently of want of food or repletion, etc.

Difficulty of digestion, oppression, eructation, etc., are of no significance in respect to gastritis. They are the effect of any condition of the stomach which interferes with its functions. Nobody supposes that gastritis is the only thing which can interfere with digestion. We will say the same of the palpitations and cephalalgia which accompany the act of digestion, and do not belong exclusively to gastritis.

Our diagnosis must be based chiefly on etiological circumstances, the general condition, the effects of various treatment, etc.

An important distinction between the neuroses, debilities, erethism—of the stomach or any other organ, or the whole system—and inflammatory diseases, is the fact that in the latter, function and act are blocked, the vital manifestations abolished, stupefied, impotent; while in the former, all these are exalted, exaggerated, mobile, aroused on the slightest occasion; in a word, have sensations and movements of which a merely inflamed part is incapable.

Thus the stomach, in the state of erethism, often gives a sensation of unappeasable hunger. A like sensation is never felt in gastritis, which is, on the contrary, accompanied by absolute disgust and anorexia. The latter is a distinctive sign of the highest importance.

When the circulatory organs, and the heart in particular, are in relation with blood which fails to excite them sufficiently to regulate and re-

strain their movements, the erethism of the system is straightway announced by palpitations, suffocation, thoracic spasms, frequency and false energy of the heart's beat, irregularities of temperature, and often a real erratic, slow, nervous fever.

The reproductive system soon gets the upper hand, and the most incredibly varied hysterical symptoms torture the life of the woman. The nervous system of animal life soon shares in the erethism, which then becomes general; and the most simple, the least fatiguing intellectual impressions, sensations and occupations overtask and worry the brain and the senses.

If, after showing the effects of slow and rapid loss of blood upon the nervous system, we should examine the effects of withholding the aliment from which blood is formed, or inanition, we should have to write the entire nosology of nervous affections, for this condition allows or excites all of them.

But let us turn to chlorosis, which presents the pathological type of the cause and the effects which we are studying.

Chlorosis.—In this disease, usually at the period of puberty, without any loss of blood, any insufficiency of food in quantity or quality, or any hygienic circumstances likely to injure assimilation, the forces which govern this process languish, the principal viscera become inert, the blood grows poor, loses its plasticity and redness through a considerable diminution of the globules. Then the most alarming debility and erethism occupy all the organs, and the patient often presents a table of contents of all the nervous affections.

What alterant force has been able to reduce the blood to this state, in which it is only an abundant serum bearing a few flaccid, pale globules, without vital affinity? What cause, what reversal, have thus stopped the movement of vital composition and decomposition? for in chlorosis these are suspended. Abundance of blood circulates in vain; it fertilizes nothing, gives nothing, removes nothing. The vegetative acts are blocked. Vital chemistry is stricken with inertia. There remain in the system none but nervous phenomena, and those of a perverted sort.

The question is not one of pure curiosity. Its solution ought to have a great influence on the prophylaxis of chlorosis, and especially on the treatment of the first symptoms.

An apparatus which for fifteen years has given no sign of life, because up to that time it had been of no use to the existence and the physiological rôle of woman, suddenly awakens, and becomes the centre of new functions which claim an amount of vitality so great and so special in its nature, that it seems as if a new creature had been added to the former ("uterus animal in animali"), and were governing it so as to characterize the woman, "making her" (to use Van Helmont's energetic expression) "what she is." Van Helmont also spoke of the uterus as a stranger in the economy, dependent on the latter only for nutrition, "pere-

grini hospitis instar, a corpore non nisi animaliter dependens;" while the woman obeyed its rule, "mero regiminis imperio, totam regit mulierem;" and it led the woman as the moon raises the water of the sea, "perinde atque luna solo adspectu aquis præsidet, eo quod uteri vita atque potestas toti imperet mulieri."

In some women this empire over the organs is established easily, without resistance, strife, or trouble. In such, the period has been long and gradually prepared for; puberty, menstruation, fecundity, the new being, develop unknown to them, and continue to bear a mild sway. Such are seldom chlorotic or hysterical unless subsequently causes arise which determine these conditions. In others, however, the period of puberty is the signal for the most violent disturbances. The establishment of the uterine functions meets with the greatest obstacles. It is chiefly then that this system rules the whole organism; for vitality deserts the other apparatus. The digestive, respiratory, circulatory, secretory systems lose a great part of their nervous influence, to the advantage of the organs of generation; and while in non-chlorotic young girls this first momentary concentration of the whole system of forces upon the uterus is soon followed by a radiant superabundance and expansion of general life, in those affected with chlorosis the compensation is not made, and the womb, the centre of so many efforts, languishes, and fails to enter upon its important attributes; it does not give back the influence of which it deprives the other organs. The relation between the acts of assimilation and innervation is almost destroyed, and these two orders of functions exhibit only disturbance, imperfection, and impotence.

Thus, there are two facts to consider in the study of chlorosis and in the interest of its treatment, although in general, and at present in the school of Paris, only one of them is thought of importance. It is taught that chlorosis consists essentially in a considerable diminution of the globules of the blood, and the disproportionate increase of the serum; and that correct treatment ought to aim at restoring the physiological composition. Here is but half of the truth; for it is said that chlorosis exists only when hydræmia is well marked: it seems that the disease only begins at this moment, though it is really only an effect which might have been anticipated at any rate.

Here it is important to enter into the refutation of the errors of the disciples of chemical therapeutics, in respect to the use of iron.

Chlorosis is defined by one of its effects, the diminution of blood-globules, and of the iron which is one of their normal ingredients. Not inquiring how the iron diminishes, and taking this fact for the disease, they do not ask how it is restored, and take restoration for cure. This is the more prized, as iron seems to contribute to the coloring matter of the blood; and, pallor being one of the most striking symptoms of the disease, the improved complexion is regarded as complete evidence of cure, and as cure itself. But where are the life and the organs meanwhile?

The specific in chlorosis is then of a different sort from mercury and cinchona. The latter are destructive specifics, alterants; iron is a more generous specific, for it directly reconstructs, by itself, like a food. It is to the chlorotic not a morbicide specific, but a hygienic specific. However this may be, it has the distinctive mark of specifics—that of acting by itself and without the intervention of the organism; and it must be acknowledged that the existence of the normal iron of the blood, its diminution in chlorosis, its reappearance under chalybeates, gives an air of probability to the theory.

The iron, then, allies itself with the pre-existing molecules of iron, and this alliance ("soldering") is all the process?

It is forgotten how, in many cases, a chlorosis which has resisted enormous doses of iron well absorbed, suddenly yields as by enchantment to a journey or an agreeable feeling, which has not introduced one atom of pharmaceutic iron into the system. Chlorosis gets well without iron just as it does with it; and there are several tonics which give the same result.

Nevertheless, if iron excites regeneration of iron in the blood more than any other medicine, the amount existing in the coloring matter of the globules is so small that the enormous size of the doses and the excessive prolongation of the treatment are evidently mere accessories, and may cause several inconveniences unless restricted within scientific limits. If, in order to cure chlorosis, we require only to replace iron by iron physically, why is it that other cachexiæ, equally marked by diminution of blood-globules, are not in the least benefited, but rather made worse by iron? The fact has been neglected, that chlorosis is almost the only kind of morbid anæmia of which iron is the special remedy. The chemists say that the vitellus of a hen's egg contains all that is needed to form the chicken. They say that traces of iron are discovered. But they do not say that after incubation, at the moment when the chicken is about to break the shell, before it can have borrowed iron from the outer world, its blood contains iron in much larger quantity than the vitellus could have furnished. We prefer to think that the analyses have been poorly made; otherwise, rejecting the idea of spontaneous formation of a simple body, we should have to conclude that the egg absorbs iron through the shell along with the respiratory elements of the atmosphere, or else that iron is not a simple body.

However this may be, iron cannot be longer regarded as a specific. Chlorosis is developed without direct removal of iron; without hæmorrhage; it recovers spontaneously, without the administration of iron; and when it recovers during its use, it does so because the hæmatosic powers of the vessels have been stimulated by it to the formation of blood-corpuscles, as the stomach and the lacteals may be to the formation of a richer chyle. Iron does not act by increasing immediately the quantity of pre-existing molecules of iron, but by stimulating the formation of new iron-bearing globules.

The power which forms blood exists previous to the iron, and without it iron would have no more effect than in a glass. We do not deny that there is a special connection between the properties of iron and the hæmatosic properties of the circulatory apparatus; but the connection is a physiological one. Iron certainly excites the formation of the red globules more specially than that of the lymph or bile, as aloes has a special power over the secretion of the intestines rather than that of the kidneys; and digitalis acts on the heart. But in this I do not see anything specific as regards the disease,—which is what a specific claims.

Iron plays one part in hæmatosis, and oxygen another. Its normal and constant presence in the globules is a token of this function. It supposes in these living bodies, and in the vessels where they are formed, certain hæmatosic energies, of the existence of which this metal is one condition.

We will say as much from another point of view concerning the compounds of soda which are so common in the blood, where they correspond as special chemical stimulants to other homologous properties of a superior order. They are not the efficient cause of the latter, but their co-ordinate excitant cause. They may be regarded as a sort of condiment, always present, always necessary for the regular fulfilment of the incessant combinations between the elements of the blood, or between it and the different organic tissues.

The sanguifacient properties of iron have some analogy with these.

Iron restores the blood by intussusception or generation, not by mixture or juxtaposition. The clinic shows daily that its diminution is an effect, not a cause of chlorosis, and that its reappearance is an effect and a sign of cure, not a cause. If one fairly grasps this fact, the question is decided. Yet there are those who admit it, and yet persist in calling iron a specific in chlorosis; which gives at once an idea of the strength of the specific and of its defenders. If the diminution of iron is only an effect and sign of chlorosis, how can its increase be a cause of non-chlorosis?

It is true that the effect increases its own cause. It follows that everything which can act against this effect has an action against the cause itself, however indirect. We maintain that if iron were the specific for chlorosis, chlorosis could not get well without iron. Therefore, when chlorosis recovers—not spontaneously, but during the use of iron, and the globules and their contained iron are regenerated in proportion to the amount used, the mechanism is the same as when they are regenerated spontaneously and without the aid of iron. Why does not the iron of the food suffice? Does the food nourish by juxtaposition? Must it not be assimilated, transformed, impregnated with the life of the organism and made akin to it? Could it produce this effect of itself, although, to use Borden's expression, it has experience of life in general? Is it, then, iron that by itself gives to the young girl this warmth, this fruitful vascular organism, this circulation of life, of sensation and movement, which seem to raise her in a few days from the reptilian to the mammal state, and revivify all the appara-

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tus, in the order in which the organs are developed in the embryo and their functions in the animal after birth?

What have we been explaining—the properties of iron or those of the chlorotic organism? Neither of these; but a true generation, occurring in the midst of a perpetual movement of blood at all points of an immense network, everywhere present, as the matrix of hæmatosis ought to be; for the function is universal in the circulatory apparatus, and in every vessel, and at all points of every vessel, blood is forming, or one act of its formation is occurring. Who that has ever watched, as a physiologist, this spectacle of chlorosis in process of cure, can deny that the process is a true organic evolution?

This generation is what we have described in the cure of chlorosis. But, though as general and as manifold as hæmatosis, it still differs from that which is constantly going on under the influence of reparative nutrition (so happily named by Bacon elementary generation, "motus generationis simplex") in these points: the elementary act, when performed by nutrition (of which organic substances are the seed), fully transforms the substance of the body and is one with the vegetative life; while, when performed by chalybeate medication (presenting only an inorganic stimulus to the blood), it has no effect save to arouse excitability in the blood and certain forces which are to this liquid what the nervous substance is to the entire system. What the chlorotic patient's blood wants is life much more than quantity. This is not so in phthisis and the cachexiæ of organic maladies. Anæmia acts primarily on the vegetative life of the blood. Thus, iron, when not injurious, fulfils in it only secondary indications.

The pretended specific action of iron in chlorosis, then, unfolds to us the spirit of the doctrine we are stating. Iron, like all medicines, acts only indirectly. The immediate and real action, the efficient action, is performed by the vivified remedy; it is the treatment, or (what is the same thing) the organism physiologically impregnated with the drug. This is what should be aimed at, and what makes a cure, provided that the system consents twice—once as in health, to the physiological action, and once as in disease, to the therapeutic action. Now, that which deprives iron of all title as a specific in chlorosis is, that as soon as the system feels the physiological action of iron, all is over; the curative effect is obtained, and the system does not assent, as in a state of sickness. Why this exception? Because frank chlorosis, exempt from all pathological association, is less a real disease than an organic imperfection in evolution. The older nosologists included it among debilities.

The genital apparatus has a powerful and quite special influence upon the digestion and hæmatosis of woman. At the epoch of puberty, if the life of this apparatus remains concentrated in itself, and does not extend its influence over the functions of individual preservation, the latter fall into a state of peculiar languor and inertia, which is one of the thousand aspects of hystericism. The digestion is impaired, hæmatosis lessened, the heart and vessels are attacked by a violent erethism and are

agitated spasmodically, like all starved organs; the functions most closely related to intelligence and will are a bizarre mixture of torpor and irritability, etc., etc.; chlorosis is present. Here is not a disease in the sense usually attached by nosologists to the word; no decided morbid vice, parasitic in the economy, the proof of which is that the healthiest woman may fall into such a state after a hæmorrhage or a simple weakness of the uterine system or accidental disturbance of menstruation. It is a want of equilibrium between the two systems, in the perfect harmony between which consists the strength and the health of woman.

We here speak of free chlorosis in those girls, generally dark-complexioned ("chlorosis fortium"), who do not suffer a loss of richness of outline, nor of elasticity of tissue. These cases form the triumph of iron, the chlorosis being pure and free from all association with a diathesis such as the tuberculous, and from all the forms of combination with other morbid elements. In these cases of free chlorosis, as soon as the system is medicated with iron, the cure is as complete as it can be—for the two are one. The harmony between the two lives may again be disturbed, and chlorosis relapse; but the cure may also persist, and not very rarely. The condition on which iron acts as a specific in chlorosis is, that the latter shall be pure, frank—that is, as unlike as possible to diseases which have specifics. Unless the iron finds these fine types, its action is uncertain, imperfect, soon exhausted, causes accidents and intolerance, acts as an inert body, or as a very irritant substance. False or symptomatic chlorosis is then a real disease, or is associated with a real disease, and at once ceases to possess a specific; an excellent proof that it never possessed one, and that in the most brilliant cases iron acts only the part of a hygienic condition. It is a kind of physiological condiment which we may suitably offer to the system when unable to assimilate food, or to feel the stimulus of the non-nutritive elements which form a natural seasoning to the food. But though the condiment acts differently from food, it does not escape the general laws of life.

Just as the food which is not assimilated is a foreign body in the system, and as this assimilation is nutrition itself, so iron (I might add soda, sulphur, phosphorus, relatively to other functions), a non-alimentary substance, but an exciting cause of sanguification, is an injurious substance in the body, as such is eliminated, and determines in it a factitious disease unless the system possesses certain properties which, revivified by iron, constitute medication by iron.

This distinction is of the highest importance, and we prove it by the difference between the cure of chlorosis and that of a simple or physiological anæmia following hæmorrhage. In curing the latter, reparatory food, meat (containing iron, no doubt) suffice. The therapeutic action is mingled with the physiological, and pharmaceutical preparations of iron are rarely needed. In chlorosis it is not so; the preparations are often indispensable. What could we say more directly against its specific nature?

We have shown that humoralism and chimiatria always take effects for causes. Does the name chlorosis (χλωρός, greenish yellow) restrict the vision of observers, preventing them from recognizing the disease before it has reduced the blood of girls to the condition of that of cold-blooded animals? It would be much better to call it, as Morton did, nervous phthisis, a term full of pathological meaning and therapeutic indications. Chlorosis is at its height when it is visible in the greenish pallor of the skin and the colorless mucous membrane. This external condition takes away the merit of diagnosis, and announces that the physician has already lost much time.

Chlorosis, before reaching this point, is long preceded by suspension of the action of the principal viscera and the alterant forces; they are as it were paralyzed, plunged in a torpor like that of hibernation, but with the difference that an infinity of nervous disorder appears in proportion as the phenomena of nutrition lose their activity, and the blood its organizable elements. Further, these nervous disorders in this case are influenced by the developing condition of the genital organs—an influence so mighty that it causes and characterizes, by itself, the chief neuroses of woman.

We may divide this malady into three epochs, which follow one another in a necessary relation of cause and effect.

First epoch.—The action of the visceral apparatus becomes slow, almost null. Assimilation is as if suspended. The heart and stomach shows their erethism and weakness by their abnormal sensations and movements. The poverty and liquidity of the blood cannot yet be accused of producing this state of languor and of nervous accidents, for they precede anæmia and produce it. This first period, during which the blood changes—or rather becomes impoverished—may last very long before the chlorosis is revealed to everybody by the complexion.

But the inertia of the assimilative forces, the erethism and the perversion of visceral innervation which are its necessary consequence, are not without influence on the composition of the blood; it loses its vitality at last, is insensibly despoiled of its organic elements, and the young girl falls into the "green sickness."

Second epoch, or confirmed chlorosis.—In general the disease is not recognized previously. The hydræmia which results from the preceding period becomes in turn a cause, and produces upon the entire system the effects of slow loss or impoverishment of blood. This indefinite aggravation of cause by effect sooner or later brings on the third period, unless the uterine functions are perfectly re-established and give to the vital faculties their normal equilibrium and power.

Third epoch, or chlorotic cachexia.—Excessive erethism of the circulatory system produces a remittent or continued nervous fever which consumes the system, and then we may say that the organism consists solely of a horribly exasperated nervous system. Life is maintained by a series of impressions, all of which are spasms or pains. The natural

hygienic agents, when exercising their gentlest effects, provoke incessant disorders of contractility or sensibility. The entire existence is but a sensation of suffering, anxiety, and general distress. The person, or its survivor, a useless nervous system, may be extinguished by exhaustion or by colliquative discharges and phlegmasias of the principal organs, such as those seen in persons who starve to death or succumb to various kinds of nervous hectic fevers.

We have now a remark of the highest importance to make.

In many cases, the external signs of the second stage are entirely wanting. In some young persons pallor never exists; chlorosis exists only to the eye of the mind, but exists nevertheless. By saying that in these cases chlorosis is seen only by induction, we mean only that the complexion is good, and may lead to errors; for the blood of the menstrual discharge (very many chlorotics have their menses), or that from leech-bites or venesection, has all the marks of chlorotic blood.

The illusions, the deplorable mistakes, the false treatment which spring from ignorance of this fact, are truly incalculable.

The fact of an undecided or retarded puberty, the resemblance of the symptoms to those of confirmed chlorosis, the patient's melancholy, depraved tastes, eccentricity of character, especially the appearance of the menstrual blood or that obtained by a slight prick, the cardiac bruit de souffle, the dilatation of the cardiac cavities, the various rhonchi, bruits de diable, whistling of the arteries, etc., etc., may furnish material for a diagnosis independently of the chlorotic tint.

But if this circumstance can give rise to so many errors, how will it be with women whom their age, the regularity of their uterine functions, the appearance of good health, seem to exclude from chlorosis, and who have suffered no loss of blood sufficient to weaken the organism and disturb the nervous system?

It is, however, very certain that most of the nervous ills of adult women—the form of hysteric which (under Anti-spasmodic Treatment) we call hysterical vapors, undecided, non-convulsive hysteria, and most of the spasms whose aura begins at the epigastric and cardiac region—are very often due to inactivity of assimilation, to poverty of the blood, which in turn are due to interruption of the normal physiological relations between the functions of reproduction and of individual preservation.

Certain developments and distinctions are here indispensable.

Sydenham, with admirable reason and medical sense, says that chlorosis is, without doubt, a kind of hysterical affection. "Chlorosin sive febrim albam quam quidem speciem esse affectionis hystericæ nullius dubito."

It would be neither less just nor less practical to state that hysteria is a species of chlorosis.

Under Antispasmodic Treatment we have admitted two principal forms of hysteria, or of nervous malady with the uterus as its focus. One is characterized by convulsive attacks. In modern works, in exam-

inations, and all the public acts preliminary to the degree of doctor, in the clinics, etc., this is almost the only one named. The chief point attended to in treating of it is to make the differential diagnosis from epilepsy.

We have said, following Sydenham and our own observation, that convulsive hysteria affects principally strong, vigorous women, those least subject to nervous evils, "temperamento ut plurimum plus quam solet sanguineo;" those of a virile habit, "habitu corporis ad viragines accedente." This form is the least interesting to study from the therapeutical point of view. It is little modified by the most potent palliatives of spasmodic disorder. Those which we are now studying under the name of radical remedies have much less influence in these cases; they may even do harm, or at any rate, no good. The true treatment for this convulsive hysteria lies in active and continual use of the muscular forces, bodily toil, and varied gymnastics, in the fatigue of exercises which women in society in general shun; for we hardly observe it in country women, in those whose position forces them to do men's work, and who, as Sydenham says, lead a hard and toilsome life: "quæ laboribus assuetæ, dure vitam tolerant."

Women of this class are mostly protected from convulsive hysteria and vaporous hysteria: the former, because the spinal innervation is incessantly flowing out for physiological acts, and the resulting fatigue prevents convulsions and produces sleep, which is their most potent solvent; the latter, because the bodily exercise produces an activity and fulness in the vegetative life, in digestion, circulation, hæmatosis and assimilation, which guarantee stability and calm of the nervous system.

This leads us to our question, and to the development of Sydenham's proposition, the terms of which we reversed, thus: the nervous ills of women, vaporous hysteria, are a species of chlorosis, or, to speak more exactly, a special erethism of the nervous system, produced by debility and insufficiency of the nutritive operations, which have become impotent to impart tone and restraint to the system.

This state, produced by the alterative or the weakness of the influence of the reproductives on the digestive, hæmatogenic and circulatory functions, develops and exists in two ways, which nevertheless do not give rise to different pathological results, and make no change in the nature of the therapeutic indications.

In consequence of natural weakness of temperament, constitutional or accidental poorness of blood, atony and imperfection of nutrition, the uterine nervous system acquires a state of erethism and predominance soon shared by the general nervous system; or else this predominance is primitive, begotten by direct causes, such as the passions and that which acts directly on innervation. In the latter case that follows, which we noted in the first period of chlorosis, namely: that the other organs are deprived of their vitality in various degrees, nervous disorders commence, assimilation languishes, and, hæmatosis and assimilation becoming imper-

fect, the woman falls into a state of doubtful, imperfect chlorosis, sufficient to prevent the nervous system from recovering its stability and the strong calm of its movements.

Hence appears the reason why women subject to the convulsive and intermittent form of hysteria are generally robust, often of vigorous constitution, while those with hysterical spasms and nervous troubles have generally a weak and languishing constitution and health. In the former, the nutrition cannot be injured by a few attacks at long intervals, affecting only the cerebro-spinal axis and its dependencies; while in the others the nervous state is almost continuous, affects chiefly the trisplanchnic system, which it distracts from its natural and regular action by a thousand tricks, and thus brings on hysterical cachexia, as we shall state hereafter, and as Sydenham formally enounced in a long passage to be seen in a subsequent volume.

If asked why hysteria takes the convulsive and epileptiform shape in muscular women of strong constitutions, while in feeble, slender women with weak locomotor powers it takes the spasmodic, vaporous form, with those infinite aberrations of sensibility and of the reaction of the lower apparatus which constitute the nervous state,—we might answer that the vigor and activity of the muscles of relation in the one call out the convulsion, so to say; that the exuberance of innervation, during an attack, is naturally exhausted by the excess of action in the most powerful apparatus; that the pathological movements follow the lead of physiological habit, while in the other the hysterical phenomena, finding an organism too delicate and feeble, do not go to the extent (if we may so speak) of reacting on the nervous centres of animal life; and instead of being distinctly affected and betraying themselves, as in all stronger organizations, by an impetuous development of external movements, they affect the whole nervous system indefinitely and without exhausting their forces, exciting disturbance which, while less violent and rapid, is still more injurious, more indefinite in extent, and more desperate. No one has better expressed than Broussais this invariable habit of nervous affections to last indefinitely, or else to show themselves by violent crises of movement—that is, convulsions.

But, besides anæmia, there is another pathological cause for these generalized diseases of the nerves, irregular hysterical neuropathies without convulsive attacks, affecting under a thousand forms the apparatus both of organic and vegetable life. We think this cause is a general affection, or diathesis, which rules and produces at once the anæmia and the nervous symptoms. Neuroses, like phlegmasiæ, are very often only the symptomatic expression of one of those general morbid dispositions called diatheses, which display themselves under all sorts of borrowed forms. When hysteria appears under these anomalous forms, its elements isolated, and in irregular combinations, rather than grouped in the order observed in the free attacks, the existence of some deeper and more general morbid disposition must be suspected. If, in addition to hysteric

symptoms, we observe pseudo-inflammatory congestions, rheumatoid affections, fever without type, a little redness of the tongue, pains in the limbs, neuralgias, anorexia, some more or less superficial catarrhal symptoms, emaciation, and finally anæmia, we have to believe that these symptoms do not form the entire disease; and we find that the anæmia often does not yield to analeptic tonics, which sometimes even increase the nervous symptoms. In this case the nervous complications are not to be attacked through the anæmia, for they are not a consequence of it. A more general cause governs both. But yet, if the digestive tract is in good order, and the lungs free from tuberculous tendencies, iron, though not victorious as in the neurosis of pure chlorosis, fills useful indications.

Hysterical spasms are not always produced by the organic affections which impair nutrition and weaken the blood, as they are by those which are destitute of this causal element. It seems as if the organic lesion then played the part of a powerful derivant or exutory, which, like all the operations of the alterant force, checks the free development of nervous symptoms. This remark is a confirmation of our general principles.

What happens, for instance, during and after acute diseases treated by repeated evacuations, and a long absolute diet? While the influence of grave inflammations (as an acute fever) exists, the nervous condition holds its peace; it is not suspected. But let the inflammatory lesions depart, the fever burn out, convalescence become established, and if proper food is too long withheld we shall see spasms appear; hysteria, perhaps for the first time in the woman's life, may display its whole budget of symptoms, until an actual alimentary fever, of a physiological nature, replaces the erethism by force and puts a check on the exasperated nervous system.

Hypochondria.

Man is subject neither to hysteria nor chlorosis, though not exempt from diseases of the nerves and anæmia. But while analeptic tonics may be required in his anæmia, it does not follow that his nervous diseases present identical indications, as may be the case in the chlorosis and the hysterical nervous ailments of women.

This difference is due to the fact that, during the whole period of uterine life, woman's neuroses have a more or less hysterical character, and that hysteria has quite close relations with chlorosis.

Man has no nervous affection or cachexia which may not exist in woman. But there are certain varieties of anæmia of which we will speak as belonging more especially to man. First, there is the anæmia of hypochondriacs, often determined by neuroses of the stomach, gastro-enteralgia, dyspepsia. Paludal anæmia holds an important place in the cachexies of man. The unwholesome professions, the excesses to which man is more exposed than woman, have their species of anæmia: such are the

saturnine and mercurial cachexiæ—those of zinc-workers, miners, forgemen, glass-blowers, bakers, etc. There are diseases of the spinal cord often associated with anæmia. It exists in certain very grave general paralyses, called progressive, which seem to attack the whole locomotor system at once, and to originate at once in the sensitive and motor terminations of the nervous system and in its centres. The latter affection is often caused primarily by a rheumatic or gouty diathesis, in debilitated persons, or those enervated by physical fatigue, grief, or excesses. It appears that the system is unable in these cases to individualize the disease, and to localize it frankly for the general benefit.

It is surprising that, since the recent exact and minute investigations into rheumatism, we still neglect the dangerous power possessed by that disease, of producing a spasmodic and secretory irritation in the apparatus of circulation and hæmatosis, indicated by morbid movements of the heart and the blood-vessels, progressive diminution of the blood-globules, and increase of serum. This produces a serous plethora and a sort of cachexia, which deserves the name of rheumatismal. This morbid state is quite common after acute inflammatory or articular rheumatism. It begins, we believe, with that disease, and forms thenceforward one of its special marks; but its character appears most clearly towards the close, when the masking inflammation becomes less intense. It is often seen persisting indefinitely after the cessation of articular inflammations, and forming a cachexia sui generis. A chronic endocarditis, an organic lesion of the orifices and valves of the heart with consecutive hypertrophy, in certain cases accompanies this condition, soon rules the symptoms, and impresses on them a character of extreme gravity. But it is certain that rheumatismal cachexia is also seen alone without any visible relation to a proper organic lesion of the heart.

Of the great number of sorts of anæmia without organic lesion, there is none in which iron succeeds so well as in chlorosis. But it must never be neglected, except perhaps in dyspepsia and gastro-enteralgia, in which, with few exceptions, it is more harmful than useful. In paludal anæmia it is useful, but secondarily. We will say as much of its accessory uses in the saturnine and mercurial cachexias. An animal regimen, wine, cinchona, insolation, stimulant baths, and frictions—these do as much as, and more than, the martial preparations.

In a word, iron finds much wider application in the diseases of women than of men; probably because chlorosis, the chief triumph of iron, is usually an element, if not the sole constituent, in woman's anæmia.

The nervous system of the digestive apparatus in man is to hypochondria properly so called that which the nervous system of the generative apparatus in woman is to hysteria.

The visceral focus of hypochondria is the apparatus of individual preservation; that of hysteria, the organs of reproduction of the species; as to symptoms, those of hysteria are all kinds of spasms or convulsive attacks. The former seem to us produced by a diffusion of the uterine

aura, more or less partial or general, to parts or the whole of the trisplanchnic system; the latter, by its extension through the sacral nerves to the spinal marrow.

Hypochondria and chlorosis, though different in origin, are alike in many symptoms, such as the gastro-intestinal neuroses, those of the arterial system, bizarre anomalies of innervation, etc. But in each the symptoms have modes, co-ordination, and very special characters.

To restrict ourselves to what concerns the digestive apparatus, we will remark that in hypochondria, these neuroses, considered by themselves, consist chiefly of dyspepsia, anorexia, epigastric anxiety, and all the functional disturbances which belong to the disease; also that, in relation to the economy, they are associated with egoism, exclusive preoccupation with self, a profound, active, restless and devouring sadness, and finally cachexia and emaciation.

In chlorosis, on the contrary, these neuroses, considered by themselves, consist chiefly, independently of the epigastralgia, of depraved appetite, bulimia, canine hunger, etc.; while, as respects the rest of the system, they go with indifference, apathy, torpor of ideas and feelings, and finally, cachexia without emaciation.

In each case there are anæmia, arterial bruits, asthenia, an absence of all appreciable phlegmasia. Does it not seem as if the same treatment would be good in each case? Yet, in the one, iron succeeds; in the other it always fails, and often does harm.

In beginning these remarks we proposed to study the laws of analeptic tonic medication by three separate inquiries, subordinate the one to the other. We have now made the first, which was intended to answer the question, how nature generally, in producing nervous disease, deviates from the physiological condition. We shall now attempt to solve the two others together, on account of their mutual dependence.

We wish to know from what conditions that physiological state results, and by what circumstances nature is aided to return to order and equilibrium. From this very Hippocratic study we shall deduce the most solid therapeutic rules.

We have said with Hippocrates, and it cannot be too often said: "the blood is the calmer of the nerves." Sydenham fully understood and fertilized this truth. He made it the leading thought in his precious dissertation on hysteria. All his views of the immediate nature of this disease, all the fundamental therapeutic indications which his vast and enlightened experience throws out, are faithful reproductions of it.

This great physician ("Op. Med.," t. I., p. 264), with his well-known inimitable expression of truth and candor, relates how, being called to a patient whose doctor had bled and purged him repeatedly and kept him on strict diet, on account of the violence of the fever, he declared that the singular nervous symptoms formed no part of the previous disease, but were solely due to lack of food—convalescence having already commenced. This diagnosis being established, the treatment was self-evident;

"ac proinde," says he in conclusion, "suadebam ut pullum gallinaceum assum in prandium juberet parari, et simul vinum modice hauriret: quo facto et carnibus deinceips moderate vescens, nunquam deinceps fletum hunc convulsivum passus est."

It is in the blood that the animal spirits (to use Sydenham's expression) are regenerated.

When the blood is not sufficiently nutritious to feed the nervous system with the elements which it is constantly expending in all the acts of life, that system falls into a state of erethism, and ceases to be in harmony with its physiological stimuli—which embrace all the external and internal agents that affect man. Hence incalculable disorders of innervation. No impression is felt as it ought to be; no movement or reaction takes place regularly, beneficially. No act of sensation or motion fulfils its physiological end. Hence spasms; for we have defined these pathological phenomena as involuntary sensations and motions, useless and aimless. "Quum enim utrisque (hystericis et hypocondriacis) desit ea spirituum firmitas quæ in robustioribus atque iis quorum facultates JUGI SPIRITUUM VEGETORUM SUBSIDIO ACTUANTUR semper invenitur, impressiones rerum minus gratarum nequeunt perferre, sed vel ira vel dolore subito perciti, perinde sunt irritabiles, etc."

After recounting the causes which determine hysterical diseases of the nerves, Sydenham, from whom we borrow these phrases, adds in relation to their immediate causes: "Cujus quidem ἀταξίας, origo atque CAUSA ANTECEDENS est debilior dictorum spirituum crasis, sive nativa ea fuerit sive adventitia; unde quavis προφάσει dissipatu faciles sunt, et eorumdem systema nullo fere negotio dirimitur." And among the most potent incidental (adventitiæ) causes of this state he notes the absence of food and loss of blood: "quum e diverso, non alia causa ita constanter pariat hujus modi affectus ac solent dictæ evacuationes."

In the whole animal economy, the vegetative functions, the acts of nutritive composition and decomposition, are the most important and require the most calm and repose; and nature seems to point to this when she withdraws these acts from consciousness, and executes them in a silence and obscurity which attest the fulness and regularity of their performance.

It has always been known that this interior, hidden or vegetative life absorbed and put in fetters the external life—the active, mobile, unstable and exaggerated manifestations of feeling and movement, which produce the physiological nervous temperament. Matter rules over and stifles the mind; digestion kills thought, etc.; such are the proverbial expressions of this fact.

In pathological states, this is found everywhere. Nervous symptoms are never fewer than when a fever or a grave inflammation exists; and these two phenomena, the most general in pathology, are essentially and specially connected with the functions of nutrition, of intimate vegetable life. If then a sanguine fever supervenes upon primitive nervous symp-

toms, the latter are quieted. Similarly, whatever be the cause of a fever, provided it act directly on the nervous system in such a way as to produce an essential spasmodic state, as soon as the class of nervous symptoms which we are studying appears, the fever ceases, but often to the patient's great risk, for reasons which we have not time to set forth here. The observation of this capital fact inspired that admirable passage in the Coan maxims: "Convulsiones sanat exorta febris acuta quæ prius non fuit; quodsi prius fuerit, exacerbat. Quin etiam prodest urinam albumineam, alvum ferri et somnos inire;" and this other aphorism: "febrem convulsioni supervenire melius est quam convulsionem febri." In fact, healthy fever and inflammation are regular phenomena, like circulation and nutrition—synergic operations which have an aim, bear evidence to the harmony of the forces, and which, while acting, exclude irregularity, incoherence, want of salutary tendency.

No one has failed to remark the curious and important differences which exist between the nervous system of a person in a long fast or under severe diet, and the same person after he has suitably satisfied his need of food.

If it be a man, we will say in brief, that he will present the most of the symptoms of proper hypochondria. If a woman, we shall see the infinite variety of symptoms which belong to vaporous hysteria; then, after a long alimentary restoration, as soon as the nervous system has received sufficient tone, the fixity and calm of action will be seen to return. The sadness, cowardice, anxiety, misanthropy, egoism of hypochondriacs will give place to the gayety, confidence, general *bien-être*, vital expansion, philanthropy of the sanguine man; the troubles, the nervous mobility, chokings, palpitations, tears, chills, pains—hysteric spasms, in a word—will be replaced by the stability, consistency, force, and functional harmony of the stout country-woman.

As Sydenham observes, hypochondria is hysteria in a man, and conversely: "Si affectiones hypochondriacas vulgo dictas cum mulierum hystericarum symptomatibus conferamus, vix ovum ovo similius quam sunt utrobique phænomena deprehendemus (loc. cit., p. 256); and further on (V., p. 259) . . . . . eorum affectuum quos in feminis hystericos, in maribus hypochondriacos appellandos censemus."

If Sydenham had not gone so far as to confound and identify these two diseases, and if his usual reserve had not perhaps prevented his assigning them to different nervous localities in the respective sexes, a difference which establishes all the difference in etiology, symptomatology and therapeutics which separates them, he would have left little to say upon the nature and treatment of these complaints, especially of hysteria.

The condition of the absence of these ills consists in a natural proportion between the nervous and the sanguine systems; an equilibrium between them, dependent on the primordial constitution of each.

If this equilibrium be disturbed at the expense of nutrition, we know the nervous troubles which follow. If it be at the expense of the nervous

system, its functions are as it were stifled, stupefied, stricken with tardiness, weakness, and true narcotism. A fed animal sleeps. A man of great digestive, assimilative, and hæmatogenic powers, who indulges his coarse tastes beyond his needs, is shamefully like an animal. He is heavy, sleepy, without vivacity or aptitude for action, dull in sensibility, thick, slow, and narrow of comprehension. The passions, the violent sentiments of love and hate, have little effect upon him. His nervous system is always asleep —Sanguis somniferus.

How often have we seen the insomnia of certain convalescents, reveries, even delirium itself ("delirium inane, vacuum") yield to a broth, or any sort of alimentary tonic! The desire to sleep, often insurmountable, which almost everybody feels after eating, is a plain proof of the calming and even stupefying influence of the blood on the nervous system.

Sydenham has perfectly comprehended and stated this need of equilibrium between the blood and the nerves in order to prevent neuroses. These are his words: "Illud enim est animadvertendum, quod non nuda spirituum debilitas per se considerata, sed eorumdem debilitas ad sanguinis statum comparatorum ἀταξίας quam patiuntur causa sit. Fieri enim potest, ut infantis spiritus satis firmi robustique sint pro sanguinis ratione, qui tamen debitam ad sanguinem adulti hominis proportionem non teneat. Jam vero, quum ex jugi lactis usu et diæta; quantumvis illa sit cruda et invalida, sanguis mollior et tenerior evadat, si spiritus ab eo nati sanguini pares tantum sint, satis bene se res habet."

Let us now reply to the third and last part of the problem; and, to conclude the subject of analeptic tonics, inquire whether in cases where nature cannot restore herself, art may so far imitate the natural operations as to do what nature herself very often can do.

Unhappily, the cases where art is needed to aid nature in restoring the balance between the nervous and assimilative systems are but too numerous. The therapeutic means for doing this are the analeptic tonics, which may be divided into two classes. The first contains the only analeptic tonic in the materia medica, iron, and perhaps the compounds of manganese. The second would include the resources of hygiene, and may be subdivided into direct and indirect remedies, the former including very nutritive ingesta which contain much in small volume; the latter, the acta, circumfusa, and applicata, including suitable bodily exercise or gymnastics, the influence of air, and cool baths.

The last subdivision does not meet the definition we gave of analeptic tonics, for its remedies do not return directly to the blood its reparative elements; but they are such potent auxiliaries, they so clearly arrest vegetative life and regulate the organic functions, that they cannot be overlooked. Furthermore, they are sometimes called upon to fulfil the indications of tonic analeptic medicine, as we shall show directly.

Martial preparations.—Sydenham (l. c.), having stated the symptoms of hysterical affections, and given his opinion as to their remote and di-

rect causes, passes to treatment, of which he lays down the foundations in these words:

"Ex omnibus quæ nos hactenus congessimus abunde mihi constare videtur præcipuam in hoc morbo indicationem curativam eam esse, quæ sanguinis (qui spirituum fons et origo est) corroborationem indigitat; quo facto spiritus invigorati eum servare possint tenorem qui et totius corporis et singularium partium œconomiæ competit."

What agent does he resort to to fulfil this fundamental indication? To the preparations of iron: "Ad sanguinem confortandum et proinde etiam spiritus ex eo prognatos, remedium aliquod martiale seu chalybeatum ad dies triginta præscribo assumendum, quod aliud non certius his votis respondet.

We need not here insist further on the importance of this remedy in chlorosis, nervous affections, etc.

It is hardly possible to state absolute principles in regard to its contra-indications. In well diagnosticated chlorosis, it rarely fails entirely, and is much more rarely harmful. Intolerance is almost always transient, and is overcome at last; and this is to be done by making a judicious choice of forms, and especially suitable formulæ, by skilful management of the doses, by selecting the surfaces which tolerate it best, by interposing days of rest in the treatment, by adding correctives, auxiliaries, etc., etc.

We must be much on our guard against deceitful contra-indications, suggested a priori by the state of the stomach or intestines.

Broussais says ("Extr. des doctr.," t. IV., p. 564): "We hear much of the success of iron in chlorosis; excellent, like any other tonic, if the stomach is languid from anæmia; very bad, if the menses are retained by a visceral irritation. We must always judge of it by the irritation, *i. e.*, by the solids."

How can a man of the experience and weight of Broussais profess that it is indifferent what tonic we give in chlorosis? What! will any tonic we please, cinchona or iron, gentian or iron, oak bark or iron, colombo or iron, equally cure chlorosis? and when we prescribe iron so universally, is it only from routine, tradition, an old relic of alchemistic prejudice which orders us to oppose iron to chlorosis because iron is strength, hardness, Mars, and chlorosis is debility, softness, feminine enervation?

It is rather because the exclusive organicists always have a horror of the remedies which are thought to act directly upon the liquids before affecting the solids; and it is hard to deny this action in the case of chalybeates.

In summing up and formulating the general indications for iron, it seems to us just and practical to say that it is chiefly of use in morbid states which are essentially characterized by inertia and profound deviation of the assimilative force, with impoverishment of the blood and all the consequent symptoms; when these conditions are not sympathetic, have come to pass slowly, and have so perverted the digestive, hæmato-

genic and vegetative powers that these functions are unable to elaborate the food as is required for nutrition, and the principal reconstituents are carried directly into the secundæ viæ.

Recalling what is said above, we shall see that this conclusion is deduced simply from the observation of the most important facts, those most characteristic of chlorosis.

We add a few very important contra-indications for the analeptic tonics, and for iron particularly.

The reaction provoked by the mistakes and exaggerations of physiological medicine has gone too far, and often has denied everything when distinctions only were needed.

We have said that gastritis, as it has been described, and we might venture to say, invented by the Val-de-Grâce, was a pathological rarity, and was only seen in cases where it was caused by irritant agents taken in incendiary aliments and in acrid poisons. This is true, except in a few rare cases which we need not mention here.

But does it follow that irritation of the stomach, subacute, chronic and obscure in most cases, is an invention made at will, which must give place to pure and physiological gastralgia, another enormity of our epoch?

No! these shades of gastritis, or, more properly speaking, of gastric irritation, are an excessively common disease, though happily very rare in combination with chlorosis, where iron is so useful.

It is a great pity that they most frequently exist in women for whom analeptic tonics seem perfectly suitable.

In the most of such cases, we find one of the following general conditions, joined to the gastric irritation in question.

Sometimes there is a herpetic diathesis, proved by dartrous dermatoses, previous or coexistent. Whatever the languor and the poverty of the nutritive functions, however great the anæmia and cachexia, iron almost always fails.

In other cases these women have been formerly scrofulous. The classic signs of this vice have mostly ceased; they are no longer called scrofulous, but debilitated and lymphatic. Their periods are bad, they can digest nothing. Almost all have subacute or chronic gastritis, which the enemies of physiologism exaggerate to dyspepsia or gastralgia, without reflecting that acquired and simple gastralgia is extremely rare, except in chlorosis, anæmia, and nervous rheumatism.

Before puberty and menstruation, gastritis and enteritis are very common in scrofulous young women or strumous and lymphatic little girls. This is plain from the state of their tongues, their lips, and the difficulty of digestion. The anti-scrofulous remedies, all excitants and tonics, do them decided harm. It is singular how iron disagrees with the scrofulous, or succeeds but partially. It is due to the fact that in the scrofulous diseases, which differ from chlorosis as one cachexia does from another, as one species of anæmia from another, irritation (scrofulous) is always imminent, and is very easily excited by iron; as Broussais says, they are

made of a very irritable material, because their diathesis produces many morbid products, the formation of which often depends upon special irritations and suppurations.

These patients cannot take iron, except when the deposits of scrofulous matter are forming in them by the laws of physiological secretion without irritation or scrofulous phlegmasiæ; as is seen in certain phthisical patients whose lungs are stuffed with tubercles without any pulmonary phlegmasiæ.

A large number of morbid nervous symptoms annoy women who seem most suited for treatment by analeptic tonics and iron; yet these persons cannot bear it—it even does them harm. In these cases there is almost always some diathesis which makes them irritable, and complicates their anæmia with a morbid principle which iron cannot conquer or neutralize. Gout, rheumatism, those various diatheses which the class of dartres imperfectly includes, are the most frequent obstacles to the success of ferruginous treatment. A cause which very often interferes with success, in spite of apparent reason for their use, is amenorrhœa in non-chlorotic women. In this case the stomach is almost always irritated; organic injury is always imminent or existent; iron fatigues quickly, fails at once, or is apparently of no use.

In all these cases the insufficiency or harmfulness of iron is natural and easy to explain. Iron is an analeptic and not an alterative. There is a cachexy in these persons, but of a very special kind—rather the effect of a diathesis which is incessantly fruitful of irritation than a simple defect of proportion among the constituents of the blood. The blood is poor, but it is vitiated by a morbific principle, and the chalybeates are suitable only for repairing a simple insufficiency, uncomplicated by any diathesis.

As to the chlorosis, we should not expect always to cure it, permanently and perfectly, with iron. By iron you give the blood plasticity and coloring material; the patient regains color and strength. The treatment is suspended, and in a few months all the symptoms of chlorosis appear in order. The blood is artificially enriched, but the woman is unable to maintain the richness without aid. Marriage takes place, and sterility, dyspepsia, menorrhagia, leucorrhœa, low spirits, palpitations, backache, constipation, sick headache, etc., show a weak constitution and a life forever embittered by suffering and by unfitness to fulfil the duties of maternity. If a woman in this state of predisposition to chlorosis, often irremediable, has a child, affections of the womb, as ulceration of the neck, prolapse, metrorrhagia, dyspepsia, infiltration, dry cough, general dilapidation, emaciation, nervous fevers, various neuralgias, etc., too often reduce the poor wretch to an unendurable and cruel state of ill-health, which at the turn of life sometimes ends in fatal organic diseases, more frequently in a premature and cacochymic old age, and most rarely by a metasyncrisis and a salutary revolution.

It is not enough then to put the ear to the carotids and prescribe iron.

Yet such is to-day the sum of the diagnosis and treatment of this affection. And those empirics—the professors of exact medicine who do no more than that—proclaim themselves as the representatives of progress!

In the cases just mentioned, iron does act, but inadequately; and a cure must depend on the combination of other remedies.

Substantial diet.—Gymnastics.—Cool baths.—These agents are potent adjuvants of the iron treatment in chlorosis and hysterical nervous disorders. We must now show in a few words the reasons which sometimes induce us to use them exclusively.

Iron, as above stated, is most proper in diseases where the blood has lost its excitant and plastic qualities slowly and by a gradual perversion of the visceral functions; also whenever the preparatory acts of vital chemistry are not performed, and cease to react advantageously upon the food so as to form assimilable principles, as is seen in chlorosis.

The alimentary tonics are good when the assimilative functions and the blood have suffered inertia and poverty for a short time, as after and during convalescence from acute febrile diseases which have imposed an active and rapid labor upon the alterant forces, or a long and trying period of coction, especially in children and vigorous adults.

Strict diet must be observed, while the alterant forces have to perform a necessary pathological task. To introduce food would then be asking of these forces an excess of nutritive action, which would check either the pathological or else the reparative elaboration. Hippocrates has said as much in his aphorisms (the 10th of section 2): "Impura corpora quo magis nutriveris, eo magis lædes."

The morbid alterant process once at an end, restriction does harm; it causes debility and nervous troubles, which do not occur while the vital chemical forces are employed in digesting and concocting pathological products.

In humoral diseases, diet is much more needful than in nervous; and a proof that the acts of the alterant forces are exclusive of the nervous phenomena, aberrations of sensibility and motility, in short, spasms, is found in the fact that in the acute humoral or febrile diseases where these pepsic forces (to use the expression of Hippocrates) are very active, there are no spasms, disorders of the nerves, and that if they appear, it is a sign of the suspension of the pathological labor and of irregularity in the course of the disease.

The food given in convalescence from acute disease seemed a very important matter to Hippocrates, who gave much attention to it in a special treatise ("De vic. trat. in acut."), and in several aphorisms of the first section.

Towards the decline of acute fevers, severe inflammations, exanthematous pyrexiæ, great sagacity is required to decide when to begin to give food. New symptoms then often occur, fever persists or appears, etc., which opportune feeding immediately puts an end to.

Galen knew that after certain fevers or intense acute diseases which

had much weakened the patient, a nervous fever arose which was calmed by analeptic tonics. "Equidem ita febricitantes aliquos ostendi tibi maxime ex iis qui e longo morbo convaluerant, quorum quum uni forte fortuna occurrissem qui mox ante horrescere cœpisset, ut rem exposuisset, dato ex vino diluto pane, continuo horrorem inhibui; atque ut semel dicam, quibus incipientis adhuc accessionis aderant symptomata, iis omnibus panem ex vino diluto esculente mature exhibens, horrorem statim inhibui et febrem prohibui."

The presumed duration of the disease, the losses the patient has suffered, which have reduced him, so to speak, to the outlines of his figure, his habits, the form of the disease, whether remittent, intermittent, or continuous, must in general form a guide to prescribing the diet. The following aphorism of Hippocrates will sum up a part of these motives: "Considerare oportit etiam ægrotantem, num ad morbi vigorem victu sufficiet, et an prius ille deficiet, et victu non sufficiet, an morbus prius deficiet et obtundetur."

Without enumerating all the cases where alimentary tonics are required, it will suffice to say generally that they are called for whenever the assimilative force and the blood have been rapidly enfeebled by abundant losses, or by diseases during which the acts of vital chemistry have been occupied with a pathological labor which demanded a protracted strict diet; and that they are powerful to arrest all the symptoms arising from these conditions, when the digestive and hæmatogenic functions retain their physiological power.

The effect of food in chronic diseases belongs to the subject of regimen and hygiene, and we need not speak of it at length. It is obvious that in these affections, as soon as the functions begin to be regular and normal in their mutual action, the alimentary tonics acquire considerable curative power, especially when aided by gymnastics, etc., of which we will now say a few words.

"The exercise of the locomotor muscles," says Broussais (Proposit. 373, "Ex. des doctr.," t. I.), "is the best means of destroying convulsive mobility. It displaces the visceral irritations (the vicious latitude which Broussais gives to the word irritation allows us to take it as meaning here pains, spasms—in a word, neuropathy) by consuming a superfluous activity, and by calling the forces towards nutrition and the exhalant and secretory tissues."

This proposition contains a profound truth, too much overlooked or despised by physicians who would suppose their cure a bad one, and themselves unworthy of their title, if they had cured without the aid of pharmacy; a truth equally despised by patients, in whose opinion the physician sinks, when he has conscience enough not to rack them with his drugs, and who think that their ills are slighted, or that a cure is despaired of, when hygiene forms the only means of cure.

It is a proverbial saying that mental labor is more fatiguing and exhausts the economy much more than that of the body; but we do

not give a physiological reason for this seemingly extraordinary difference.

Does the man of the closet, the meditative writer, living from morning to evening in the immobility and silence of study, expend more vitality than he whose labor demands continual bodily movement and muscular activity in the field? No; but if the latter expends much, he repairs much, while the former expends without repairing.

Too continual and intense exercise of thought keeps the man of letters in a continual nervous state. The vital movements, instead of being expansive, fruitful, imparting activity to the organic processes of vegetable life, such as digestion, circulation, hæmatosis, secretion, etc., are compressed, chained, and the assimilative force languishes; hence the frequency of nervous diseases in this class of men. Their labor, instead of increasing the functional activity of the nutritive organs, is an incessant cause of languor and perversion of these organs, and soon the cause is increased by its effect. Imperfect digestion, whence want of appetite; no desire for alimentary repair; difficulty of secretion, exhalation, discharge; inertia of the respiratory functions; deficiency of muscular fatigue; indigestions; excessive cerebral activity; and, as a result of all combined, loss of sleep, that beneficent tonic.

Thus, without fatiguing himself, without making a legitimate expenditure of life which might cause a need for salutary repair, these persons forbid their system the satisfaction of its most important demands, by weakening and diverting the acts which preside over the fulfilment of its wants.

The contrary is the case with those who do bodily labor in the open air. They expend an enormous amount of vitality, in return for which they get a keen and genuine appetite which they satisfy to purpose and for legitimate needs. Their hæmatosis is powerful, their circulation active; the secretions and exhalations abundant and of good quality; their sleep profound, natural and restorative.

In such persons the acting forces (to use Barthez' expression), in constant and well proportioned exercise, far from being exhausted, simply increase the sum of radical forces, in which they constantly find new power of action. We have seen that the nature of analeptic tonics is to invigorate the radical forces of the system. "The energy of the radical forces increases in a ratio compounded of the intensity of the action of the forces acting in each function, and the constancy of the mutual relations habitually existing among all the functions. . . . .

"The repeated agitation of the entire body in suitable exercise, and the repeated impressions of fresh air, excite the radical forces of the vital principle." (Barthez: "Nouveaux éléments de la science de l'homme," t. II., p. 168.)

There are women, subject to disorders of the nerves, in whom neither iron nor alimentary tonics can recall the nervous functions to order; they are chiefly such as are subject to convulsive hysteria, with some who are

plagued with spasmodic and vaporous hysteria. The only useful tonics for these are bodily exercise, kept up with great perseverance, and well directed gymnastics.

There are other women of vigorous and sanguine constitution, subject to all the hysterical spasms and the nervous ills chiefly attributed to delicate and puny women. For these, the only therapeutic indication is to consume by muscular exercise their superfluous activity, and to direct their forces to nutrition and to the exhalant and secretory tissues, as Broussais has it.

The species of tonics which we are now speaking of is perhaps the only one suitable for hypochondriacs, who hardly ever can support the tonics of the materia medica on account of the excessive irritability of their gastro-hepatic system, which sometimes becomes a degree of irritation and chronic subinflammation, especially when the malady is old. We know what confidence Sydenham placed in horseback exercise in these diseases: "Æt vero nihil ex omnibus quæ mihi hactenus innotuere, adeo impense SANGUINEM SPIRITUSQUE FOVET FIRMATQUE ac diu multumque singulis fere diebus equo vehi. Quid quod SANGUIS perpetuo hoc motu indesinenter agitatus exagitatus ac permistus quasi renovatur ac VIGESCIT."

The same end, again, reached by different means. It is still analeptic tonic treatment, with the immediate object of restoring the nutritive forces.

But much method and attention are required in order to give these tonics in suitable form and dose. Not only ought muscular exercise not to exceed the limits of the individual strength, but it is indispensable that they be regulated with respect to the sort of affection for which they are used. They ought to occupy and call into activity all the functions of relation and to be in harmony with an intellectual or moral aim; to be proportioned to the sleep and food, and seconded by suitable temperature and clothing: great persistency must be used, and no discouragement felt because no benefit is felt at the outset, since all hygienic remedies have a progressive, gentle, slow, insensible, but yet durable and profound influence.

"The increase of radical force which is produced indirectly by an exercise of the functions conformable to health, demands our chief attention. It is always in a ratio compounded of the intensity of the action displayed by the acting forces in each one of the principal functions, and of the maintenance of the mutual relations of activity among these functions which habit has established in the form of health which belongs to each person.

"The radical forces thus reproduced (by bodily exercise) offer less resistance to the causes of disease in persons who habitually lead an active life, and in those who work hard nearly every day" (Barthez).

Cold baths are another sort of tonic, and a very potent sort, through the calm which they impress upon the nervous system—a general, uniform, equal calm, soon followed by an excentric, general, uniform reaction, full of harmony and spontaneity. This happy reaction, aided and sustained

on leaving the bath (which never should be prolonged in these cases, but should last eight or ten minutes in water cooled gradually to 25°, 24°, 20° =77°, 75°, 68° Fahr.) by dry or aromatic frictions, massage, a fortifying meal whetted by cordials, etc., is indicated by a physiological fever, which is the most powerful antagonist of nervous maladies.

A general fever of this sort silences the nervous mobility and extinguishes the sympathies, far from arousing them, as the physiological school pretends. "The fever overwhelms," is a popular expression upon which physicians have not reflected sufficiently. Fever is the type of salutary reactions. It is the leading form of disease.

When to the tonic effect of cold we can add massage produced at the same time by the douche, we get at once a double action, which gives to the nervous system, the capillaries, and by sympathy to the whole economy, a durable, fortifying impression which is to be preferred, in certain lymphatic and irritable subjects, to the internal tonics which they usually bear so poorly. We think the cold douche, in the hands of a prudent physician, called upon to play an important part in tonic reconstituent treatment. Dr. Fleury, who has specially studied the influence of this precious remedy, sums up his experience in the following propositions, which are based on principles like our own, and form a natural part of the present statement.

1. Stimulant cold douches should be placed in the first rank among reconstituent remedies, in virtue of their action upon the capillary circulation, and consecutively upon the composition of the blood, calorification, nutrition, and innervation.

2. More rapidly and surely than any known hygienic and pharmaceutic remedies, they modify the lymphatic temperament and substitute an acquired sanguine temperament. This happy influence seems to have been attributed to a double action: one upon nutrition and the composition of the blood, the other upon the capillary vessels, the vital contractile powers of which are so aroused as to cause blood-globules to penetrate vessels which previously admitted only serum. Cold douches further exercise a very favorable influence upon the development of the body and the muscles, and the establishment of menstruation.

3. Five young girls, from eighteen to twenty-two years of age, for several years subject to confirmed, grave, rebellious chlorosis, which had resisted all known hygienic and pharmaceutic modifiers, were treated by cold douches; all recovered; the duration of treatment was seven months in the longest case, two in the shortest, and four in the average.

The effect was always the same, at first appearing in the digestive and muscular apparatus, then in the nervous system, and lastly in the blood and circulation.

4. Idiopathic anæmia and anæmia in convalescents disappear quickly under the influence of cold douches, owing to their action on digestion, nutrition, and the muscular system—an action which aids the restoration of blood better than that of any other remedy.

5. In symptomatic anæmia connected with certain uterine affections (displacement and engorgement), with old obstinate neuralgias, certain neuroses, and hypertrophy, cold douches have a double curative effect, curing both simultaneously, and often the one by means of the other.

6. In anæmia with abundant and repeated hæmorrhage, cold douches have a very remarkable double action; by producing renovation of the blood, and combating organic congestions, they diminish or arrest the hæmorrhage which had been aided by the anæmia they produced; thus helping the patient to break the vicious circle which is so often seen in practice.

7. In anæmia in a curable affection which is not influenced by cold douches, the latter render important service by improving the patient's general state and thus rendering the treatment and the cure of the primary affection more easy.

8. In anæmia joined to an incurable affection, cold douches are often very useful; they have remarkably improved the condition of several patients with pulmonary emphysema, organic affection of the heart, cancer, and abdominal tumors.

We close this part of our treatise by observing, first, that all those organic reactions which are effected by the most general and rudimentary acts—by the functions which M. Récamier calls common vital acts—such reactions as fever and inflammation, are the most legitimate, the most calculable, the most critical, the most salutary.

Those reactions of the system which are effected by special acts and without involving the common vital functions, are characterized by directly opposite traits; such are all the nervous diseases; they are incalculable in their course, incoherent in their symptomatic expressions, without critical tendency, incapable of furnishing criteria for judging themselves.

Thus the former, dependent on the common vital functions shared in by every living being, occur with harmony, unity; have calculable periods, a term to which one can assign a date and a mode.

The latter are manifested by anomalies in the action and influence of the special functions (those which exist only in certain animals), go on without order, without harmony, have nothing calculable, persist indefinitely, and cannot be foretold in the succession of their symptoms, or in their modes of termination.

Nevertheless, observation informs us that these two classes exclude each other, and that a substitution of the first for the second is desirable, because the most natural solution—a result, as we have seen, of their respective characters. (For a fuller development of these ideas, see the inaugural thesis of one of us: "Essai sur les lois de la force médicatrice," Paris, février, 1835, No. 36.)

The analeptic tonics make the common vital functions, the force of assimilation, predominate in the organism, and consequently cause the most calculable, legitimate, and salutary reactions.

Therefore, they are the true and natural remedies for the nervous affections which we have here mentioned.

The last argument which we shall bring in support of this capital therapeutic law is one which we have learnt from a thousand daily observations, to wit: that constitutions characterized by predominance of the assimilative force are not subject to nervous diseases, but are easily put into a well-marked fever in all the morbid reactions they have to endure; but those of a nervous temperament, and much subject to spasms or diseases of the nerves in either sex, rarely experience fever and seldom react by pyrexias.

If to this be added what is to follow under antispasmodic medicine, in reference to palliation of essential nervous diseases, we dare to hope that we shall have given the fundamental principles for the treatment of this numerous and important class of disease.

Sydenham felt clearly the need of having at his disposal two classes of resources in treating these diseases, and could employ the antispasmodics simultaneously or alternatively, as is seen in the following: "Quoties vero paroxysmus invaserit, si tale aut tantum sit malum ut inducias ferre nolit, donec sanguine et spiritibus corroboratis, quasi per ambages sanari possit, confestim ad remedia hysterica ista confugiendum est, quæ odore viroso ac gravi, spiritus, ut dixi, exorbitantes ac desertores in proprias stationes remandant, sive intra corpus sumantur, sive naribus admoveatur odorando, sive externis applicentur; cujus modi sunt asa-fœtida, galbanum, castoreum, spiritus salis ammoniaci et quicquid est denique quod odorem tetrum admodum ingratumque spirat" (Syd: "Op.," t. I., p. 276.)

It were to be wished that all the diseases of nerves were included in this class which we have described. But unfortunately, the neuroses, diseases without material, like the phlegmasia, the diacrises, etc., are the morbid manifestation of all known diatheses, and to these tonic treatment is rarely applicable, while iron is usually hurtful.

It is also very necessary to recollect what we have taken pains to show, by pathological arguments which we perhaps have carried too far, namely: that anæmia or cachexia has its species, like inflammation; and that, as there are scrofulous, venereal, gouty, dartrous phlegmasiæ, etc., there are anæmiæ or cachexiæ which are symptomatic of all these diatheses. In these anæmiæ, also, iron is almost always contraindicated. Unless, then, we wish to compromise the general principles laid down in this chapter, we must apply them only to the class of nervous diseases and to the sorts of anæmia which we have carefully distinguished.

CHAPTER II.

ASTRINGENTS.

Tannin.

We shall speak very briefly of the employment of pure tannin, and more at length of remedies of which it forms a considerable ingredient.

From its solubility and the ease with which it is given, it is used in all cases where astringents are recommended.

Internally, in chronic diarrhœas, the dose is 1—5 centigrammes (gr. 0·15.—0·75) for children, 5—50 centigrammes (gr. 0·75—7·5) for an adult. In severe hæmorrhages, 10 centigrammes (gr. 1·5) every two hours, till four grammes (60 grains) have been taken. In chronic blennorrhagia, pulmonary and uterine catarrh, in the dose of 25—50 centigrammes a day, for one or two months.

M. Charvet, professor at the secondary school of medicine at Grenoble, has used tannin with advantage in the sweating of phthisical patients, given in the dose of 2½—10 centigrammes (0·4—1·5 gr.) during the 24 hours, usually in the evening, and with opium.

M. Mialhe, guided by his chemical theory of albuminuria, proposed to combat this affection with tannin. It has been thus employed by several, not without some advantage. M. le docteur Garnier and Dr. Tilling, of the province of Venice, among others, have shown that in the high dose of 2—4 grammes (30—60 gr.), associated with cinchona, it modifies specially and notably the anasarca which accompanies albuminuria. Besides, the urine itself is seen to become more abundant, and by degrees to regain its physiological character; at the same time the patient regains appetite and strength; in a word, the chief symptoms improve quite rapidly, sometimes from the first days. But, to avoid mistakes, we must add that these good results are scarcely obtained except in acute, or at least quite recent, albuminuria, that is, where the lesion of the kidney is slight or superficial; while, in an advanced case of Bright's disease, tannin fails or is not lasting in its effects.

M. Chansarel, of Bordeaux, whose father made most interesting experiments on tannin, published in the *Bulletin médical de Bordeaux* (octobre, 1810) a memoir on its therapeutical use. This paper (perhaps a trifle exaggerated in its claims) places tannin among the most useful of drugs. In addition to the curative powers above mentioned, he speaks of some which are still more precious. He found that it cured intermittent fevers as well as sulphate of quinine; for which purpose he gives a progressive

dose, rising from 60 centigrammes to 2 grammes (9 to 30 grains) in 150 grammes (nearly 5 ounces) of water and mucilage of gum arabic. Of this solution the patient takes a dessertspoonful every three hours during the intervals of the disorder. This only confirms what is said by Pezzoni ("Histoire de la Société de médecine pratique de Montpellier," 1807.)

Dr. Leriche, of Lyons, has very lately demonstrated beyond a doubt the excellent effects of tannin as a substitute for cinchona in intermittent fevers. These results are quite in accord with our views regarding the mode of action of cinchona or sulphate of quinia as an antiperiodic; that is, in our view this property in tannin (though exaggerated by these different authors) may well be only the consequence of the tonic astringent and reconstituent properties which it possesses in a very high degree.

M. Chansarel also prescribes it as an anthelmintic: "Children who have taken it in syrup or draughts or injections, in the dose of 30—50 centigrammes (4·5—7·5 gr.) have been perfectly cured, and have passed a large quantity of worms" (*Ibid*).

Finally, we must not omit its virtues as an antidote. According to M. Chansarel, it is a certain antidote in poisoning by verdigris and other salts of copper, lead and the saturnine preparations, tartar emetic and the preparations of antimony, cantharides, opium and its compounds, conium, hyoscyamus, stramonium, the organic alkalies in general, mushrooms, etc. (Chansarel: *Journal de la Société de médecine de Bordeaux*, 2e série, t. VIII., p. 316.) Without sharing in this enthusiasm, we yet recognize very gladly that it has evident value in the above cases of poisoning.

The astringent property of tannin has suggested to M. Woillez its use in the catarrhal element of diseases of the respiratory passages. He says that, when given in pills of 0·15 grammes (2¼ gr.) until sixty per day have been taken, it promptly affected acute bronchitis, which seemed to be passing off too slowly. In these cases the quantity of sputa expectorated and of râles heard diminished remarkably from day to day. M. Woillez, thinking that this effect was produced by moderating the bronchial circulation, was led to use tannin in pulmonary bronchial congestion, and particularly in typhoid fever. He has such confidence in the action of tannin in relieving congestion of the lung that he considers the remedy a touchstone to diagnosticate phthisis, since after the disappearance of congestion, the bruit which remains must all be laid to an organic affection. But this test is scarcely possible except in atonic phthisis, for (as M. Woillez admits) tannin aggravates febrile and erethic phthisis (*Bull. de thérapeutique*, 1863).

Externally, as a gargle, the dose is 4 grammes (60 gr.) to 250 grammes (8 oz.) of water, in chronic inflammations of the buccal and pharyngeal mucous membrane. In powder, like snuff, for rebellious epistaxis and acute or chronic coryza. In injection, in vaginal and urethral blennorrha-

gia, in the dose of 10—50 centigrammes (1·5—7·5 gr.) to 30 grammes (1 ounce) of vehicle. As a rectal injection, in proctorrhœa, chronic diarrhœa, chronic dysentery, in the dose of 1—1½ grammes to 500 grammes of water (15—22 grains to 16 ounces). In collyria, in catarrhal ophthalmia, 10—20 centigrammes to 30 grammes of water (1·5—3 gr. to the ounce). In ointments, for local treatment of dartres and fissure of the anus. With glycerine, it has succeeded in certain rebellious forms of herpes, especially h. præputialis. Plugging the vagina with a mixture of glycerine, 80 grammes (2½ oz.) and tannin 20 grammes (5 drachms) (Demarquay), has been found very useful in acute and chronic vaginitis. The plug is to be renewed every twenty-four hours. The tannin ointment has just the same virtues.

(Glycerate of tannin.)

℞. Powdered tannin.....10 grammes=154 grains.
Glycerate of starch.....50 " =770 "
Mix with care.

Tannin, employed locally like alum, has recently been lauded by some in the treatment of croupous and even diphtheritic angina. But it is more useful in œdematous laryngeal angina, when water strongly charged with tannin is thrown in vapor into the throat, by a pulverizer.

To lessen the cutaneous inflammation in erysipelas, we are accustomed to spread with a pencil upon the affected part a layer of a solution of tannin 20 grammes (ʒ v.), camphor 40 grammes (ʒ x.), sulphuric ether 100 grammes (ʒ xxv.). The ether in evaporating leaves tannin and camphor in powder on the skin, which acts as a sedative and resolvent.

As an epithem it is applied to the skin to contract the tissues, resolve nævi materni, etc. Associated with benzoin and applied to the pustules of small-pox from the outset, it is proposed by M. Homolle as an abortive, especially for the face, to prevent disfiguring cicatrices.

Finally, M. Mialhe uses a solution of tannin to show in the urine a species of albumen which is not precipitated by nitric acid, called albuminose.

M. Debauque, a pharmacist of Antwerp, was the first to show that iodine is soluble by tannin. Following this indication, M. Boinet made it a general rule to use as a vehicle for iodine some astringent syrups which contain tannic acid, such as the antiscorbutic syrups, syrups of horse-radish, gentian, walnut, cinchona, bitter-orange peel.

Combination of iodine with tannin, or liqueur iodo-tannique.—A direct association of these two bodies has been lately effected by MM. Socquet and Guilliermond (of Lyons). In this combination iodine is soluble, is deprived of its caustic properties and its smell, without losing any of its therapeutical virtues. It is claimed that, in this form, the iodine is much more active than in iodide of potassium, and presents none of

the inconveniences which exist when iodine is diluted with an inert substance.

The authors have obtained by this chemical composition two solutions: one called neutral, because starched paper indicates no trace of iodine, which is capable of dissolving, in addition, a quantity of iodine equal in weight to half the tannin used; the second is the result of this addition, and is called ioduretted iodo-tannic solution.

Tannin from rhatany has been preferred by the authors because it has less astringency than quercitannin; the latter is reserved for external use.

The syrup prepared from the iodo-tannic solution is very limpid, of a splendid red color, and agreeable to the taste; 30 grammes of syrup contain 6 centigrammes of iodine (2 parts in 1,000). This amount (nearly ℥ i.) is the dose to begin with; it may easily be increased to twice that quantity per day.

The solution for external use, prepared with quercitannin, contains 5 grammes of iodine to 100 of vehicle.

We will not mention the numerous advantages attributed to this very rational combination. It is, however, a very recent importation, is not well defined chemically, and we have no experience of our own to enable us to decide upon its merits.

We must add that M. Barrier, of Lyons, has used the iodo-tannic solution externally, in injections for fistulæ resulting from cold abscesses, and in hydrocele, in which he states that he has obtained as good results as from tincture of iodine.

He has also employed this agent as a coagulant of the blood. Injected into varices, it has produced a less prompt action than perchloride of iron, but very analogous. Here is a subject for fresh surgical experiment (*Gazette hebdomadaire*, mars, 1854).

M. Desgranges, of Lyons, has continued these experiments on the liqueur iodo-tannique, and attests its astringent and hæmospastic property, which he attributes exclusively to the tannin, and not to the iodine. Both are taken up by absorption, while the perchloride is not absorbed. He concludes that this compound is likely to be as useful in surgery as in medicine (*Gazette médicale de Lyon*, mai, 1854; *Union*, 1854).

Tannate of Quinia.—This compound is a new preparation, introduced by M. Barreswil.

Berzelius foresaw the advantages of this compound, arguing from the theoretical idea that, while quinine is the chief active ingredient in cinchona, the tannin contained in the bark must have a share in the effect.

A commission named by the Academy, and reported by M. Bouvier, subjected this new compound to numerous experiments, and found that it possessed a power at least equal to that of sulphate of quinia, both in intermittent fevers and in acute rheumatism and certain neuralgias.

In addition to its antiperiodic and sedative, or contra-stimulant properties, which it shares with sulphate of quinia, certain quite special virtues have been attributed to tannate of quinia.

The first of these is that the tannate is much cheaper, and for this reason is suited to country practice. A second advantage is that it is very much less bitter; and, finally, it does not irritate the digestive organs as sulphate of quinia sometimes does.

The dose has been stated as nearly the same as that of the sulphate; but later trials show that the dose ought to be a little larger, in order to act surely in intermittents.

It is said to be not only an excellent febrifuge, but a very potent tonic. In the dose of 20 centigrammes daily (3 grains), it is claimed to be one of the most valuable and meritorious "reconfortants." It has been proposed as a remedy for phthisical night-sweats, in which case it would be indicated by its double quality as tonic and antiperiodic.

With all these advantages, some of which are real, and some require to be better verified, one objection is made to the tannate, namely, its amorphous and insoluble form, and the consequent facility with which it may be adulterated.

A fresh study of tannate of quinia must be made; and in order to procure it of a definite composition, the admirable directions of Regnault, lately presented to the Academy of Medicine, may be followed:

1. The pure tannate of quinia cannot be obtained by simple precipitation of the acetate of quinia by a solution of gallo-tannic acid (tannin from gall-nuts), a procedure very generally recommended.

2. The compound resulting from the reaction of tannin upon the basic and neutral sulphates of quinia retains a portion (about 3 per cent.) of sulphuric acid, which cannot be removed. It forms a sort of sulpho-tannic varnish, different in composition and properties from the tannate proper.

3. When basic sulphate is dissolved by the help of acetic acid (method of Barreswil), the precipitate is also sulpho-tannic. Owing to the presence of acetic acid, the water used to wash this substance retains about one-fifth of the total amount of tannate of quinia; this fifth may be recovered by neutralization with bicarbonate of soda.

4. The formula of the Strasburg pharmacopœia should not be adopted, as its proportions render it impracticable, and it requires an amount of quinia nearly twice that found in tannate prepared chemically by double decomposition.

5. The method described in my memoir gives a regular and identical result; the directions are as follows: into an aqueous solution of acetate of quinia such a proportion of purified tannic acid is poured that the precipitate formed at the beginning of the process is redissolved entirely. This liquid, carefully neutralized by bicarbonate of soda, throws down tannate of quinia, which is easily washed and of uniform composition.

6. As thus prepared, tannate of quinia contains on an average 20·5 per cent. of quinia, and corresponds to a definite compound $C_{40}\ H_{24}\ N_2\ O_4 - 2\ (C_{54}\ H_{22}\ O_{24})$, in which tribasic tannic acid is in excess relative to the quinia, a diacid alkaloid.

7. The physical coefficient of solubility of tannate of quinia in water cannot be determined, because, under the chemical influence of water, the salt slowly decomposes into gallo-tannic acid, which dissolves a small part of the tannate, and a more basic tannate which remains dissolved.

8. Tannate of quinia is quite soluble in aqueous solutions of the organic acids, which do not precipitate the tannic acid from these solutions. It is not soluble, at least not immediately, in the mineral acids, which have the property of producing in liquids containing tannin those insoluble deposits studied by Strecker.

9. In physiological and therapeutical experiments, it is well to note that 1 gramme of neutral sulphate of quinia is equivalent to 3·50 grammes of pure, dry tannate.

M. Vulpian is now comparing the properties of pure tannate with those of the sulpho-tannic combinations which have often taken its place in ordinary medicine. The results will be presented to the Academy.

Tannates of lead, zinc, bismuth.—Tannate of lead, as used in medicine, is a bitannate obtained by precipitating a concentrated infusion of gall-nuts, or better, a solution of tannin by liquid acetate of lead.

Autenrieth and M. Yoth have praised it in the treatment of gangrenous ulcers. M. Ricken has prescribed it with success, to cicatrize the bed-sores of phthisical and typhoid patients.

Tannate of zinc has been used under the name of "Sel de Barnit," in the treatment of gonorrhœa.

A tannate of bismuth has been introduced by M. Cap, who obtains it by dissolving, in water acidulated with nitric acid, 44 grammes of crystallized nitrate of bismuth, and precipitating by a slight excess of soap-maker's lye. The precipitate is collected and washed, and triturated in a mortar with 20 grammes of tannin; a paste is made with water, which is placed on a cloth, washed, and dried.

It may also be obtained by precipitation. In spite of the efforts of MM. Aran and Bouchut, who recommended it as a good astringent, it is now almost abandoned.

Oak-bark, Tan.

Oak-bark owes all its virtues to tannin and gallic acid.

A very remarkable fact has been observed at the Veterinary School of Lyons. Large doses of oak-bark were given to horses and goats. A horse who had taken 10 kilogrammes in a month (300 ounces Troy), had redder, more viscous, more consistent blood at the autopsy; his body remained two months without giving signs of putrefaction, whereas horses putrefy in a very short time, even in winter, if it does not freeze ("Compte-rendu des travaux de l'école vétérinaire de Lyon," 1811). Hence the direction to give large doses of tannin internally when gangrene threatens to invade a limb after severe wounds; the principle does not apply to dry gangrene. The mortified parts ought also to be covered with tannin

to arrest the progress of putrefaction. It is for experience to decide how far tan should be given in various forms of typhoid disease.

Porta (*Revue médicale*, t. III., p. 493) has given oak-bark internally in active and passive hæmorrhages. He prescribes it in the dose of 2½ grammes (38 gr.) daily, which is plainly too little. Topically, the decoction has been used in hæmorrhages, leucorrhœa, blennorrhagia—in a word, in all cases where tannin and rhatany have been recommended.

Lightermen sprinkle their shoes with tan when they leave their work, thus preventing the increase or development of the trouble which they call grenouille, which is a softening of the derma with alteration, with cracks and often wasting of the tissues which are much in contact with water. It occurs on the heel, below the tendo-Achillis, etc., especially between the toes; it is easy to see how the remedy acts.

The febrifuge virtues of tan seem very doubtful to us, in spite of what Cullen may have said in his "Materia Medica" (t. II., p. 47). As regards the fact stated by Barbier of Amiens ("Matière médicale," t. I., p. 328), that in a suburb of Amiens there is a tan-mill where the laborers never have intermittent fever, while those who work at other employments in the neighborhood are often affected, we do not question it, since Barbier affirms it; but since, in other parts, those who grind tan take intermittent fever like other people, we think the immunity in these cases must be due to circumstances which have escaped Barbier's observation.

The acorns of quercus ilex are eatable; those of q. robur are scarcely eaten except by beasts. But both kinds are used in medicine, after being roasted like coffee; they contain nearly one-tenth part of tannin. They are afterwards ground fine, and from the powder a liquid is prepared as coffee is made, which has exactly the color of the latter, and tastes pleasantly, especially when milk is added. This sort of coffee is very useful for children after weaning, when they have those obstinate non-febrile diarrhœas. It is also useful to persons whose digestion is laborious and who are subject to looseness. In a word, it may be given as coffee to irritable patients whose digestive functions are hindered by a chronic phlegmasia.

Walnut, Walnut-husk.

For twenty years past the leaves of the walnut have enjoyed a high repute, as astringents, tonics, and detersives. But their chief fame has been as an antiscrofulous remedy; there was even a time when they were thought a true specific against scrofula.

Jurine, of Geneva, seems to have been one of the first to use the ptisan of walnut-leaves for lymphatic engorgements. Dr. Psorson, of Chambéry, recalling the successes of the professor, gave it to a beggar with old scrofulous ulcers, and by the influence of this remedy alone, in ptisans, lotions and cataplasms, obtained quite a rapid cure; since when he has continued to employ it with advantage.

In France, Dr. Négrier, of Angers, has tried the walnut-leaves on a very large scale, and has published several interesting memoirs upon the subject. Perhaps he was wrong in ascribing to this remedy an almost specific virtue. But, allowing for a little exaggeration, we must admit our debt to him for having pointed out the value of walnut in the various forms of scrofula.

The effects produced by the internal use of extract of walnut-leaves are at first general: the influence of the remedy upon local symptoms appears later. The action is generally slow, requiring from twenty to fifty days, according to the nature of the symptoms and the constitution of the subject before the effects become sensible.

In non-ulcerated strumous glands the action is not seen for quite a long time; while in ulcers and fistulous openings, whether kept up by bony caries or not, the action is quite prompt. But their final cure is sure to require a long time, which makes it sometimes impossible to ascertain the exact part played by the remedy, and that by time.

Finally, the author values the remedy very highly as a collyrium in scrofulous ophthalmia.

The resolvent and detergent properties of walnut-leaves are often made useful; many employ the decoction to advantage as an injection in the treatment of leucorrhœa and chronic metritis.

M. Vidal (de Cassis) has advised the injection of this decoction into the uterine cavity, to cure catarrh of the organ. But MM. Bretonneau and Hourmann have shown beyond a doubt the extreme danger of such injections, which, reaching the peritoneal cavity through the tubæ, may cause fatal peritonitis. (Hourmann: *Journal des connaissances médico-chirurgicales*, octobre, 1840). Dr. Cazin, of Boulogne, has used the decoction of the leaves, or the husk, as gargles, from the beginning of tonsillitis, and says that he has often aborted the inflammation.

In résumé, according to the numerous experiments of M. Négrier, of Angers, which have been verified by a large number of physicians, it seems incontestable that walnut-leaves, though certain claims in regard to their marvellous virtues in scrofula may not be proved, are very useful in that affection. We will add that, owing to their resolvent and detergent powers, they give good results in the treatment of old ulcers, and still better in chronic catarrhs of the different mucous membranes.

In a communication made to the Academy of Medicine some years ago, Professor Nélaton, in the name of Dr. Raphaël, of Provins, proposed the fresh leaves and root of walnut, as of remarkable virtue in malignant pustule and charbon. It appears that this topical application had succeeded brilliantly in the hands of a southern practitioner, Dr. Pomayrol; while Dr. Raphaël says that he obtained a rapid cure in four patients affected with œdema of the eyelids in charbon, or with confirmed malignant pustule. In spite of the miraculous nature of these results, which we may naturally distrust, we have not thought best to omit mention of them.

The husk owes its astringent virtues to the tannin and citric and malic

acids which it contains. These give it the same title to use as oak-bark, kino, etc.; while its bitter principle gives it some of the properties of the bitter astringents.

A pleasant liqueur is made from the husk, which is useful in sluggish digestion, when not due to chronic inflammation.

Hippocrates and Dioscorides recommended the husk as an anthelmintic, to be given as an extract, in the dose of 50 or 60 centigrammes (7—9 grains). This property is much contested. At present it is not admitted to possess, in infusion, decoction, or extract, any higher powers than belong to gentian and centaury.

Pollini's ptisan, made with the husks of walnut and various other active substances, is somewhat popular for the treatment of constitutional syphilis and inveterate dartres; we do not attribute to it an anti-syphilitic power sufficient to enable it to supplant mercury and iodine, or a power of curing dartres without the aid of any other tonic, but it is a useful adjuvant, especially when the severest symptoms have subsided.

Uva Ursi, Comfrey, Whortleberry.

The uva ursi (arbutus uva ursi), a plant of the family of the ericaceæ, enjoyed during the last century a reputation to which Murray, the illustrious author of the "Apparatus Medicaminum," contributed not a little. In this work may be read the tales of its almost miraculous powers in the treatment of diseases of the kidneys and the urinary passages. It is still used as a diuretic, on a par with many other analogous remedies, but no more.

But uva ursi certainly has astringent properties, due to tannin and gallic acid, which it contains in such large quantities that in some parts of the North it is used to tan leather and make ink. In cases where an astringent effect is desired we prescribe the decoction of the leaves internally and externally. MM. de Beauvais, Coslithes and Gauchet (*Bulletin de thérapeutique*, 1861, t. II., p. 181), have lately represented it as an excellent substitute for ergot in childbed, to excite the uterine contractions and arrest hæmorrhages due to the inertia of the uterus. The dose given is from 4 to 8 grammes (1 to 2 drachms) of the powdered leaves in a quart of ptisan, or if the extract be prescribed, it is given in the dose of 0·3 to 3 grammes (4·5 to 45 gr.) per diem, in 3 or 4 doses.

M. Braconnot has remarked that the leaves of uva ursi are often replaced by those of vaccinium vitis idæa, which is very abundant in the Vosges. They are distinguished by their brownish green color; they are less entire, that is, are slightly dentate, their edges always fold downward, their transverse nervures are very apparent, their lower surface is spotted with very remarkable points.

Uva ursi is often mixed with leaves of the box (buxus sempervirens, L., of the euphorbiaceæ); they are recognized by their oblong-oval form, their crenation at the top, their glossy surface, their transverse and longitudinal nervures.

doses, at distant intervals, and very near a meal, when gastric juice abounds, they will always meet enough hydrochloric acid to be converted into chlorides (Lambossy: "Considérations physico-chimiques relatives à l'absorption des médicaments minéraux;" Thèse, Strasbourg, 22 avril, 1836.) Nevertheless, the analyses of gastric juice which have been made by Claude Bernard and Barreswil inform us that muriatic acid is rarely found free in the stomach; the acidity of gastric juice is chiefly due to lactic acid.

Blondlot and Cl. Bernard, in an important paper, have pointed out the difference in the action of alkaline carbonates, when concentrated and when largely diluted. If bicarbonate of sodium is given in concentrated solution or in crystals, the gastric secretion is suspended; while if greatly diluted, it first saturates the free acids of the stomach, and then produces a very abundant gastric secretion. The use to be made of this fact is evident.

Plethora.—Bicarbonate of sodium has of late been very much used in preference to the other alkaline salts, in the treatment, both preservative and curative, of various morbid states, chiefly characterized by the predominance of the stimulant nutritive and plastic elements of the blood. Such a condition is found in the various forms of physiological or morbid plethora, rheumatic and gouty affections, and the whole class of acute inflammations.

There is scarcely a physician who does not daily employ solutions of bicarbonate of sodium, or better, natural Vichy water, to modify the plethoric condition which is caused by too succulent food, want of muscular exercise and intra-visceral combustion, a condition so frequent in rich, sensual and unoccupied persons, especially in large cities. The same remedy is often indicated in persons of the sanguine temperament, who, from hereditary influence or accidental causes, have a more or less marked predisposition to congestions and apoplexy.

In these conditions, bicarbonate of soda is undeniably useful in more than one way, both by removing the embarrassment of the digestive organs which is often connected with plethora, and by modifying the crasis of the blood, and correcting the excess of acids and the predominance of the plastic elements.

By insisting on this alterative treatment, yet always with prudence and reserve, and enjoining the use of a proper rule of living, we may benefit this tendency to plethora and this habit of congestion which, in many persons, forms an incessant danger and a perpetual torment; it is even possible in some cases thus to prevent cerebral hæmorrhage, or at least, to postpone its first attacks or relapses.

In these circumstances, bicarbonate of soda is given in the dose of only one gramme (gr. 15) per day. This is continued for a week or two, and is afterwards gradually increased to 2 (gr. 30) or a little more, with the precaution of suspending its use from time to time, and never making the doses too large.

In the chapter on alterative treatment we mention the importance of the part played by alkaline remedies, especially bicarbonate of sodium, in the treatment of inflammatory diseases. For example, in pneumonia and pleurisy, as well as in acute forms of articular rheumatism, it is certain that alkaline drinks, at the head of which stand the solutions of bicarbonate of sodium, are a very useful auxiliary to bloodletting.

Bicarbonate of sodium has very lately been used in acute pneumonia to the exclusion of all other remedies, and is said to have had success. We find no trouble in believing this, for frank pneumonia is one of those diseases which seem to adapt themselves most readily to many forms of treatment, including the expectant. Nevertheless, in severe cases, it will always be more prudent to put the alkalines in the second place, and not needlessly to compromise them by giving them the precedence over more powerful and approved remedies, such as bloodletting and contra-stimulants.

Diphtheria.—Bicarbonate of sodium, as an alterant, seems naturally indicated in diphtheritic affections. It had long been in use for membranous angina and croup, but had never earned such a place by any results obtained. However, it had retained the modest position which it really deserved, down to a recent time, when certain brilliant successes, some real but purely accidental, others doubtful or very questionable, called the attention of the public very loudly to the remedy, and presently, enthusiasm coming to its aid, the carbonate of soda was almost taken for the specific antidote of diphtheria, and even of croup.

Such enthusiasm could not last, and calm reflection and observation soon showed things in their true light. Bicarbonate of sodium has not been given up; but when it is used in membranous angina and croup, it is associated as an auxiliary with other more active remedies. Owing to its alterant and antiplastic action, it may be of use in modifying the general diathesis which seems to preside over the development of the diphtheritic affection, or in acting topically on the false membranes which coat the pharynx or the air-passages, and promoting the softening and detachment of the membranes. In these two ways it may be useful, but it is far from having that excessive importance which had been ascribed to it.

Gravel, calculi.—All the alkaline solutions, and especially those charged with bicarbonate of sodium, at the head of which we will put Vichy water, possess the power of rendering the urine alkaline very rapidly. This property led to the idea of dissolving vesical concretions or calculi. Magendie is perhaps one of the first who expressed this idea and urged physicians to make the experiment.

This method of dissolving calculi had been long known, if not expressly formulated by science. The many remedies called lithontriptics, such as snail-shells, recommended by Pliny, the famous specific of Miss Stephens, Saunders' potion, the remedy of Juride and Chittiks, the ptisan of Mascagni, etc., all these have carbonates of sodium or potassium for their base, and their unquestionable success is due to the fact of their alkalinity.

Guided by these empirical facts, and by more recent and decided observations and experiments, due to such eminent chemists as Arcet and Berzelius, a certain number of physicians responded to Magendie's appeal, and by experiment established the positive solvent efficacy of alkaline solutions or waters, whether given in drink or as baths, or as injections.

The leader of these experiments was Dr. Petit, inspector of the waters at Vichy, who concluded that those waters "act not only by increasing the secretion of urine, and thus facilitating the discharge of calculi, but that their essential and most pronounced action depends on a communication of their chemical properties to the urine, which is thereby enabled to dissolve and disaggregate the calculi, as far as their volume and chemical composition permit it."

To explain the destruction of a great number of calculi upon which the alkaline salt has no direct chemical action, M. Petit brings forward the following consideration: "Too much attention cannot be given to the vesical mucus, which mingles with the calculous matter, is interposed between its particles, increases their adhesive force, and, in a word, acts like a cement. The calculus, therefore, contains a sort of agglutination of animal and saline substances. The waters dissolve the saline part, which, deprived of its cement, is deposited in little lamellæ and is ejected with the urine; thus they may act on phosphatic calculi, especially those composed of ammoniaco-magnesian phosphate, almost as effectively as on uric acid." He infers that, even when the waters do not chemically act upon the elements of a calculus, whatever its composition, they may by disintegrating the components diminish them by degrees, and cause their natural expulsion from the bladder.

This claim on behalf of the Vichy waters, that they act upon all calculous concretions without exception, has necessarily met with much contradiction. Some have denied the truth of the facts, that is, of the solution of the calculi, whatever their composition; in proof of which they offered direct experiments in which calculi, exposed to contact with Vichy water in or out of the bladder, underwent no diminution in weight or alteration in texture. Others, and the more numerous party, while admitting in general the favorable action of the waters in certain calculous affections, especially gravel, opposed, and with good reason, the too exclusively chemical explanation which was offered.

Passing over the exaggerations and the false explanations, to which time has done justice, we can say that the Vichy water has gained its cause; and no one can now question the efficacy of alkaline waters, especially those of Vichy, in gravel—an efficacy attested by cures, to which most physicians can bear witness.

There is, however, a distinction to be made between the different kinds of gravel. They may be divided into two chief groups: 1, those due to uric acid and its compounds; 2, those caused by phosphatic deposits.

The value of alkaline solutions in uric acid (red) gravel, the only kind

which is caused by a true diathesis, is almost universally admitted. Experience has shown very positively that the use of alkaline salts, and particularly, a season or several seasons at the Vichy Springs, favor the expulsion of the gravel and seem to assist in preventing new formations for some time.

But this unanimity is not found in regard to phosphatic gravel, the white variety. In the latter case the urine loses its acidity and becomes neutral or alkaline. At first view, the chemical theory seems to forbid the use of alkaline waters; and we know that savants of the first rank, including Marcet and Prout, have made objections, apparently of great force and justice, to this remedy. But other chemists, not less distinguished, particularly M. Mialhe, have attempted to bring equally convincing arguments on the other side.

We shall leave the chemical question to the chemists, and confine ourselves to observation and clinical facts. If, on consulting the facts, we find that the alkaline treatment does not possess in phosphatic gravel the same evident efficacy which it displays in uric acid gravel, we think, nevertheless, that it does render valuable service in the former cases.

Phosphatic gravel does not depend upon any general state of the system, as does uric acid gravel; it is a purely local affection, usually seated in the bladder. It is almost always due to a catarrh of that organ; in which case the urine is retained by an obstacle to its free passage, and becomes subject to an ammoniacal decomposition.

Not to speak of the chemical reactions, which are said by some authors to exercise in this case a local action very advantageous in the affection of the bladder, there are yet other facts which seem to speak in favor of Vichy water. It is said that large quantities of mineral water, introduced into the system, cause a continual renewal and increase of the urinary secretion, dissolving purulent mucosity, modifying beneficially diseased surfaces, arresting the formation of ammoniacal products; and that in this way we remove by degrees the cause of the deposit, and the precipitation, and attack the disease at its source.

In brief, it is by an almost identical action, that is, by the introduction of a large quantity of carbonate of soda into the system, that Vichy water is useful in most affections of the urinary passages which are characterized by gravel or calculous concretions. While modifying the pathological state of the vesical mucous membrane and liquefying the mucus, it also acts on the composition of the blood, preventing the formation of uric acid or neutral phosphates, and thus changing the constitution of the urinary principles so that on reaching the kidneys and bladder they no longer contain insoluble substances adapted to form precipitates (*Extract from a notice of the Vichy waters*, 1854).

In this method of stating the action of alkalines upon affections of the urinary passages, which seems to express the present leading opinion among the physicians of Vichy, we are glad to see that there remains something which is not reduced (as in the past) to a purely chemical

action; that the success of the treatment tends to be referred, at least in a very large share, to the physiological influence exercised by the treatment, both upon the system and upon the diseased organs.

Can a real and durable cure be conceived of as effected without a general and profound modification of the whole system—an action of the remedy upon the morbid diathesis, when the latter is universally recognized as the true cause of the disease?

In other words, how else can we interpret the remarkable and constant fact, that persons who have taken alkaline waters for several months, and who have been relieved of gravel while taking them, remain for several months and years without forming new gravel, after ceasing to use the alkali? In this case, are we not absolutely forced to admit that under the alkaline treatment not only does the urine, ceasing to be acid, become unable to form new calculi, but that the remedy has modified the kidneys, or the digestive organs, or the whole economy, so that the entire diathesis, in a word, if not destroyed to its foundation, is at least restricted in its manifestations?

Gout.—In the chapter on alterative treatment we shall speak of the nature of the curative action of alkaline drinks, and especially of Vichy water, in gout. The physicians at Vichy are not agreed upon this point. Our own experience has been as follows:

The disease is very rarely cured radically by this treatment; we may even say that, in the case of hereditary and strongly constitutional gout, the remedy is usually impotent.

But we cannot deny that in cases of simple regular gout, its effects are more marked; the frequency, the duration, and the intensity of the attacks are usually lessened, and sometimes the local accidents are caused to disappear. Though it usually has but little action on nodes and other tophaceous concretions about the joints, it nevertheless easily resolves, to some extent at least, the engorgements which proceed from rigidity of the ligaments and contraction of muscles.

To tell the truth, Vichy water in a good many cases produces an immediate aggravation of symptoms, or various accidents after a lapse of time. The bad results are chiefly found in abnormal and irregular gout, especially in the atonic form. And to be frank, we have good reason to think that the Vichy waters have repeatedly caused metastases, which have proved fatal.

We need not repeat what has been said above as to the danger of the abuse or the untimely use of alkalines.

In the treatment of gravel, the sesquicarbonate or bicarbonate of sodium is given for two or three months in the dose of from 2 to 30 grammes per day (gr. 30—450), in one, two, or three quarts of water.

Diabetes.—The utility of alkalines in diabetes was known in the last century. Lime-water was then prescribed as a means of relieving the excessive thirst and diminishing the renal secretion. Veterinarians were very successful in curing a disease of horses called la pisse, by giving Spanish

white mixed with water. At present, an infinite variety of alkalines is given; carbonate of lime, bicarbonate of sodium, magnesia, etc. But these remedies do not act in the system as they do upon sugar in the test-tube. They act as powerful modifiers of nutrition, placing the patient in special conditions, by virtue of which the abnormal production of sugar ceases to occur. We should not seek to produce absolute alkalization; these remedies must be given simply as adjuvants, in moderate dose, and only for a certain time, eight or ten days in each month, and no more.

Aphthæ.—Professor Gubler has shown that the presence of aphthæ is connected with suppression or great diminution of the saliva with partial dryness of the mouth and collection of the products of epithelial desquamation, to which are added fermentable alimentary substances. Acidity of the mouth commonly denotes the presence of spores in the mucus, and indicates that clusters of oidium albicans are about to appear. Gubler deduces the rational rule, that all alkalines cure aphthæ; he usually employs bicarbonate of sodium.

Borax or Biborate of Sodium.

Stomatitis and angina.—Borax is chiefly used as a wash, by mixing it with equal parts of honey, or in the proportion of a fourth, an eighth, a twelfth; it is recommended in foul ulcers of the gums, of the inner aspect of the cheeks, in thrush, and pultaceous angina (Bisset, Gooch, Veryst, Starke, Gmelin, "Apparat med.," continuation of Murray, Baup, de Hyon, "Bibliothèque de Genève," t. XL.: Récamier, "Leçons cliniques de la faculté de médecine de Paris"). In cases of laryngeal catarrh we prefer syrup of borax to gargles, especially for children. It is given by teaspoonfuls eight or ten times a day, with the precaution of not drinking immediately afterwards, in order to prolong the contact of the salt with the affected mucous membrane.

In angina, aphthæ, thrush in children or even in adults, it is often sufficient to use it in a wash, sometimes with the addition of opium in cases of stomatitis and that painful angina which attends fatal cachexiæ (phthisis, cancer, cirrhosis, etc.).

Pruritus of the mucous membranes and the skin.—In vaginal injections it is useful for leucorrhœa caused by a slight erosion of the os tincæ; and in pruritus of the male and female genitals (Dewees: *Bibliothèque médicale*, t. LXIV., p. 136).

In certain very irritable persons it is a good substitute for sulphate of zinc or copper in collyria, calming the erethism of the conjunctiva, and acting with sufficient energy as a styptic.

Hufeland and Récamier have brought it into repute in our times. Hufeland, and after him Reinard, following Starke (see Gmelin, l. c.), order it dissolved in water or mixed with various mucilages for the treatment of dry superficial diseases of the skin accompanied by a very pain-

ful feeling of itching and burning, such as facial eruptions, and frost-bites. (*Journal de chimie médicale*, t. II., p. 591; *Archives générales de médicine*, t. XVI., p. 137).

Borax given internally, has a certain lithontriptic value in uric acid gravel and calculi, by virtue of its alkalinity, and independently of its sedative effect.

Dysmenorrhœa.—Accouchement.—The compiler Gmelin calls attention (l. c.) to another property upon which he quotes a great many authorities. This is its power of assisting menstruation, of quieting the uterine pains which accompany or precede the function, and even those which appear during parturition; of producing the lochial discharge, etc. It is probable that borax owes these qualities to the soda it contains; as to its special action on the uterus during parturition, we shall wait for more evidence. Hufeland (*Journal d' Hufeland*), Lobstein (of Strasburg) (*Journal de médecine*, de Leroux, t. XXXVI., p. 107), Van Krassendonck (*Bulletin des sciences médicales de Ferrussac*, t. XI., p. 275), also recommend it for rendering the labor-pains regular and for reviving the uterine contractions; but Duchâteau, who used it for the same purpose and in the same doses, states that he derived no benefit from it (Société d'émulation, novembre, 1876).

We must add that Dr. Spengler of Ems has more recently sought to define more precisely the indications for this medicine. He believes that borax is of especial use when the woman is suffering from exaltation of sensibility, where there exists a spasmodic condition of the uterus which opposes the act of parturition, and is accompanied with cramps and pains. If this be so, borax is indicated in conditions precisely the reverse of those where ergot of rye is demanded. The internal dose is from 2 to 4 grammes (gr. 30—60).

Lime.

Acescence, pyrosis, acid dyspepsia.—Infantile diarrhœa.—For the first six months of life, the fluids of the infant's mouth are normally acid; and the stools are also often acid, especially when they have that greenish tint which so often replaces the normal yellow. This green color is due to a blue substance, which often appears as such on the diaper, and, with the yellow color of the fæces, forms a green of varying depth. When the alteration is slight, the blue color is not produced until several hours after the fæces are expelled, and appears first upon the diaper, afterwards on the parts of the fæces that are exposed to the air. But when the alteration is greater, the entire mass is affected, and the color appears shortly after defecation, or before, and the fæces, as passed, are of a very strong green, almost blue.

This acescence, often associated with diarrhœa and erythema of the buttocks and thighs, is remarkably benefited by mixing lime-water with

the milk in the proportion of a fourth, or by giving it in sweetened water, if the child is at the breast.

In the adult, the buccal mucus, mixed with saliva, generally has an alkaline reaction, and the acidity of the mouth, when it exists, almost always accompanies that of the stomach.

The painful acidity or burning sensation at the stomach, pyrosis, is not produced by an excess of gastric juice, but by the acids which are formed at the close of the fermentation of starchy matters, wine, and alcoholic liquors. The acid regurgitation occurring long after eating, when the starchy substances are not digested, may have been rightly interpreted by Galen; for he says that it occurs when there is an acid corruption of the food in the stomach.

This affection is remarkably improved by alkalines, and in particular by lime given under the form of mineral lime-water, or of pastilles containing tribasic phosphate of lime. M. Delpech has made tablets of the gelatinous tribasic phosphate with gum tragacanth, which gives the best results.

Lime is the best of all alkalines, if there is diarrhœa; but if there is constipation, preparations containing soda or potassa should be preferred.

To young children suffering from acidity, with vomiting and diarrhœa, we may give powdered oculi cancrorum, in the dose of 0·2—0·6 (gr. 3—9); for adults the usual dose is 4 grammes (ʒ i.).

Diarrhœa.—In chronic diarrhœa, in those due to ulceration of the intestine, more particularly the large intestine, lime-water, used as a drink or an injection, has been used; Bretonneau, of Tours, has praised its effect in the diarrhœa which retards convalescence from dothinenteritis and dysentery. In the former disease he used to give lime-water, from 30 to 60 grammes a day shaken with warm sweetened milk; in dysentery he used it in the same way, at the same time ordering a whole injection morning and evening, which contained from 120 to 200 grammes (℥ iv.—vi.) of lime-water, and 3 or 4 drops of Rousseau's laudanum.

Phthisis.—M. J. Guyot, having a phthisical patient at the hospital St. Antoine, who had used phosphate of lime to arrest night-sweats, continued to use the medicine, and applied it to many other similar cases. In a few it failed; in a greater number the sweats lessened or disappeared. M. Guyot in some cases was able to suppress and to restore the sweats with certainty by giving or withholding the phosphate of lime. The dose varied from 2 to 6 grammes per day (*Bulletin de thérapeutique*, 1870, t. I., p. 140).

Dr. Beneke, of London, recommends phosphate of lime in phthisical diarrhœa. We often use the following formula of Frémy's in consumption:

Hypophosphite of lime.....	12 grammes (ʒ iii.).	
Ammonio-citrate of iron.....	8 " (ʒ ii.).	
Cinnamon powder.....	q. s. for 24 powders.	
Benzoin.....		

Rachitism.—Osteomalacia.—Phosphate of lime was recommended for rachitism in 1793, by Bonhomme, of Amiens, but was not adopted in regular practice, in spite of the praise of Hallé, and the experiments of Chossat. In 1844 Piorry took up the remedy, thinking, like his predecessors, that he could deposit phosphate of lime in the bones where it was wanted. He prescribed the powder of scraped bones. In 1852 M. Mouriès improved on this, by giving the phosphate in small doses mixed with an albuminoid matter, which, unfortunately, is too often acid. The remedy has been twice abandoned: it has been tried for a third time, but will probably soon be given up once more.

The latest experiments are as follows:

We know that the bones are liable to changes which produce softening, deformity and fragility. These changes may occur in infancy, constituting rachitism; in adult life they are called osteomalacia, and in old age, senile osteomalacia. Nevertheless, there is more than a simple question of age; the affection in infancy differs from the softening of adults, and the latter does not resemble that of old men. The microscopical lesions of rachitism are not absolutely the same as in osteomalacia; they proceed from arrested development, while the affection in the adult is a real atrophy, or rather, as is now said, a detrophy. It is possible that this detrophy may be found not to be a primary affection, but the common element in determinable pathological conditions.

As to the senile atrophy which causes fractures or deformity of the bones, it is a well-known affection of old age, in animals as well as in man, in regard to which the most complete information may be found in the thèse of Paul Bouley (Paris, 1874).

In animals, osteomalacia has always been produced by the same cause—an excessively dry summer, which makes the fodder poor in important minerals. Phosphate of lime has been given in all forms to these animals without satisfactory results; while they have been completely cured by transferring them to places where the forage was richer.

We will say as much of rachitism; it is much easier to cure it by rich food than by phosphate of lime. Rachitism and osteomalacia are no more cured by phosphate of lime, than anæmia is by drinking blood, or neuroses by eating brain.

It does not, however, follow that lime should not be given to such patients. We can say here what we said of iron. The preparations of lime are much more efficient by their action upon the digestive tract than by their transportation in substance to the bones.

The preparations which we have found most efficient in rachitism and osteomalacia are lime-water and saccharate of lime. Food may be taken which contains much phosphate of lime, as army-bread (containing a certain amount of bran), and beans and haricots.

Fractures.—M. Alphonse Milne-Edwards supposed that by the addition of a certain quantity of phosphate of lime to the diet a portion might be fixed in the callus. He gave it to wounded persons under the care of

M. Gosselin, and to animals, as rabbits, in whom he had produced fractures. His conclusion is, that he accelerated the ossification of the callus, and that the treatment might obviate to some extent the danger of non-consolidation (*Bulletin de thérapeutique*, 1856). The practice was taken up by M. Fano (*Union médicale*, 1859, t. III., p. 24), but has since fallen into disuse.

Lymphatism.—M. Mouriès states that phosphate of lime plays a more important part in animals than has hitherto been supposed. Independently of its influence upon ossification, the salt has a special action upon irritability, without which neither assimilation nor nutrition could take place. An extreme deficiency of this principle produces death with all the symptoms of inanition, and a deficiency in a less degree produces numerous affections which are connected with lymphatism. M. Mouriès, by his examinations and analyses, has been led to the conclusion that the food of the inhabitants of cities is usually defective in this point, the daily quantity consumed by women in cities being less than half that which is needful (6 grammes or ʒ iss.) to the economy. As a consequence, he shows that the milk of nurses in cities is poor in fixed salts, and particularly in phosphate of lime. Hence, the fœtus and the young infant must suffer considerably from the absence of a substance which is indispensable to their existence and development. This is one of the chief causes of the enormous excess in the number of still-born children, of the prevalence of so many diseases among infants, and their very great mortality in large cities.

To remedy this evil, M. Mouriès proposes to add to the diet of pregnant women, wet-nurses and infants, the nutritive principle which is deficient. It is his plan to associate phosphate of lime with an albuminous substance; and he has prepared a kind of fine bread or paste, which is to be given in soup to nurses or mothers or children, whenever there is reason to think that the phosphate of lime is deficient in the food or the milk, or whenever the child's health seems to require it.

In support of these wholly theoretic considerations he presents a certain number of cases in which this kind of food is said to have lessened the number of still-births in certain families, to have diminished the number of lymphatic diseases in children, and even to have aided in curing them when not prevented. Among the affections akin to lymphatism which may be thus benefited, he names debility from birth, rachitis, deviation of the spine, deformity of the bones, retarded dentition, and slow growth.

These ideas have supporters abroad. Dr. Beneke, physician to the Dalston German hospital in London, published a paper in the *Lancet* of April 19, 1851, which tends to the same conclusions: he points out the importance of phosphate of lime in growth, and regards scrofulous patients as deficient in this salt. Hence he has treated ulcerous scrofulidæ by the internal administration of lime, and claims great success.

Baryta.

Chloride of barium has for some years enjoyed a certain reputation in the treatment of white swellings. Crawford, in 1780, was the first to recognize its good effect in scrofula. More lately, Professor Scassi of Genoa, has made investigations, and since then, in Italy, MM. Mojon, Nongiardini, Ferrari, etc., have had good results, while in France, at the instigation of Pirondi, the Italian experiments have been repeated at La Pitié by Lisfranc, with incontestable success.

The mode of administration is as follows:

Lisfranc usually began with a mixture of 30 centigrammes (gr. 4½) in 125 grammes (say 4 oz.) of distilled water, of which the patient took a tablespoonful every hour, except an hour before and two hours after meals. The patient, in order to endure this medicine, must abstain from wine and flesh, and confine himself to pure water and vegetable diet. At the end of a week, if no acidents occur, he doubles the quantity of the salt in the same amount of water, and thus continues to increase gradually, giving in some cases as much as 3 grammes (gr. 45).

The unpleasant symptoms which may oblige the patient to suspend the use of the remedy for some days, consist of pain about the stomach, nausea, vomiting, etc. These first symptoms of poisoning are readily dissipated by the white of an egg, or by sugared wine, as M. Pirondi has advised (*Bulletin de thérap.*, t. X., 11e livraison).

Lithia.

Gravel.—Garrod claims to have established the action of carbonate of lithium when given internally. He has used it several years, in cases of uric acid diathesis connected with gravel, and in chronic gout, and has always obtained the most satisfactory results. Taken internally, twice or three times a day in the dose of from one to four grains dissolved in water, it produces no direct physiological action; but in persons who pass uric acid gravel, it has a marked influence by lessening the amount of the deposits, or arresting them entirely. As there have never been any bad consequences, Garrod considers this remedy the most suitable to drive away attacks of gout and improve the patient's condition.

Gout.—Carbonate of lithium is by no means destined to replace colchicum. Its use is in chronic gout. It is valuable for preventing the return of attacks, and for dispersing the remnants of the disorder. In certain cases it has caused old nodules to disappear which were supposed incurable.

M. Charcot quotes in particular ("Garrod on Gout," p. 490) the case

of a woman aged 77, who had been treated for tophus, at Wiesbaden, without success, and afterwards used the following drink:

Carbonic-acid water.....	500 grm.= ℥ xvi.
Bicarbonate of sodium	0·25 grm.=gr. iv.
Carbonate of lithium.....	0·10 " =gr. iss.

The concretions were said to have disappeared in two weeks. Charcot does not guarantee the fact, given by Stricker, and we understand him; but as he thinks it worthy of mention, we follow his example in desiring physicians to try this remedy, which, if it do not disperse the tophus, will produce no bad effect ("Garrod on Gout," etc.).

Ure has proposed to inject carbonate of lithium into the bladder to dissolve urinary calculi.

Ammonia.

Spasmodic diseases.—Cullen regarded ammonia as the best antispasmodic. M. Levrat-Perroton has praised its effect in whooping-cough. It has been recommended in cases of migraine, in doses of 5 or 6 drops in an infusion of tilia or orange-leaves. Dr. Baraillier, of Toulon, states that in attacks of nervous headache, muriate of ammonium relieves almost instantly; he gives 3 grammes (gr. 45) in 3 doses, in solution, with half an hour's interval between the doses. We shall not speak of the advantages of ammonia in paralysis. It is too evident that we cannot attach great confidence to what Bichat says upon this point, according to Jahan de la Chesne (*Journ. de méd.*, t. XIX., p. 260). Fournier Pescay and François d'Auxerre regarded it as the most trustworthy remedy in tetanus ("Dict. des sciences méd., t. LV., p. 31); the dose in this case should be large, and may be as much as 15 grammes (in divided doses) per day [gr. 230].

M. Martinet believed that an epileptic patient might prevent an attack from coming on, if he swallowed a draught containing ammonia during the initial symptoms.

Diabetes.—In speaking of soda and potassa we stated that they had been used for their alkaline properties in the treatment of diabetes mellitus. Certain physicians, struck with the dryness of the skin of diabetic patients, and hoping to produce sweating by ammonia or its carbonate, gave it as a sudorific; they observed an improvement which they attributed to the diaphoretic action of the remedy, but which ought rather to have been attributed to its alkaline properties.

Hodges (*London Med. Gaz.*) quotes the case of a young girl of seventeen, extremely diabetic, who passed 12 litres (quarts) of urine, in 24 hours. He first gave 25 centigrammes of carbonate of ammonium every three hours, confining the patient to the use of coffee, bacon, meat, and vegetables without sugar. The disease was improved in four days, and cured in two months and a half.

Barlow has a theory which approaches the truth. He thinks (and is the only one who has the belief) that the increase of urine is caused by the diuretic effect of the sugar, that is, its excitant action upon the kidneys. He prescribes the sesquicarbonate in the dose of 25—30 centigrammes (gr. 4—5) or more, with a few drops of tincture of opium in a bitter infusion, to be repeated every six hours; the diet to be animal, with antiscorbutic plants. He reports four cases in support of this treatment, but carefully states that he is far from offering the method as one which must succceed in all cases (*British and Foreign Med. Review*, Oct., 1841).

Pneumatosis.—The neutralizing action of ammonia has been employed very successfully by veterinarians in case of gaseous distention of the paunch in ruminants (*Bulletin des sc. méd. de Férussac*, mai, 1826). The animal takes a drench containing a large quantity of ammonia, which unites with the carbonic acid gas that distends the stomach, relieves the meteorism at once, and arrests the fermentation of the mass of food. This plan ought to be adopted for the treatment of persons; it is stated by chemists that carbonic acid forms a large part of the gases which are naturally or accidentally developed in the digestive passages. The value of such draughts or injections is easily seen in certain cases of meteorism.

Acidity.—Ammonia acts in the same way in the treatment of poisoning by acids, and in that of acidity of the stomach; the formula advised by Chevallier in the latter case is the following: Distilled water, 150 grammes (about ℥ v.); water distilled from mint, 15 grammes (gr. 230); ammonia, 3 drops; to be taken in one or two parts (*Journal des connaissances méd.-chir.*, t. I., p. 342).

Alcoholism.—In poisoning by alcohol and animal venoms the virtues of the volatile alkali have been exaggerated in the most ridiculous, not to say the most mendacious manner. In slight intoxication, as is shown by the observations of Girard and Chevallier (*Revue médicale*, nov., 1823), and Piazza (*Bull. de thérap.*, t. VII., 1834), a dose of 15 or 20 drops of ammonia in a glass of sweetened water is useful, though Chantourelle brings facts upon the opposite side; but when intoxication is profound, the alkali is insufficient. Nevertheless, we ought to say that M. Rigal (*Arch. gén. de méd.*, t. XVII., p. 601), gives an account of a beggar, dead-drunk, who could not be restored except by giving him 8 drops, and afterwards 4 drops of ammonia.

M. Tessier of Lyons, who has great confidence in ammonia, and considers it one of our best alexipharmaca, claims to have used it with benefit in certain permanent lesions resulting from the abuse of alcoholic drinks, as amblyopia, and in diseases caused by the emanations of tobacco-leaves.

M. Scharn, after trying in vain all the remedies which have been recommended for the chorea of drunkards, conceived the idea that this disease, being merely drunkenness at its apogee, ought to be treated by the remedies which are successful in the latter, and that, consequently, ammonia

ought to be perfectly adapted to all the requirements of such cases. With this evidently false idea in his mind, he has ordered for delirium tremens the liqueur ammoniacale pyro-huileuse [crude ammonia], or more simply, succinate of ammonium; by which simple means he says he has seen the severest symptoms, the most furious delirium, conquered as by enchantment after a few hours, without any other remedy. Brachet of Lyons has more recently praised ammonia in the dose of 15 drops in a glass of water in delirium tremens (Casper's *Wochenschrift*).

Poisoning by hydrocyanic acid.—Our last remarks are applicable to poisoning by hydrocyanic acid. We have been witnesses of the experiments of Dupuy at Alfort, intended to show the value of volatile alkali and of carbonate of ammonium in the treatment of this kind of poisoning. We can state that a horse, poisoned by 36 drops of Scheele's prussic acid, recovered spontaneously in two hours; and that the same horse, similarly poisoned the next day, and treated in a quarter of an hour by the carbonate of ammonium, recovered as before, but remained longer sick; and yet this singular fact, the most important circumstances of which were omitted in the telling, produced the same impression as that of Bernard de Jussieu, and ammonia was regarded as the antidote of hydrocyanic acid as truly as of the poisons of the viper, scorpion, bee, etc.

The principal compounds of ammonia used in medicine are: the carbonate, the acetate, and the muriate.

Carbonate of Ammonium.

This salt is strongly alkaline, and owes its medical virtues entirely to ammonia; we do not ascribe to it any special virtues. The dose is twice as large as that of ammonia.

In England it is used in syncope and epilepsy, being inhaled, with precaution, from a wide-mouthed vial. Various aromatic essences are added to the salt.

Peyrilhe, and after him Biett, obtained favorable results from the use of the subcarbonate in certain inveterate forms of syphilis, especially the syphilidæ. M. Cazenave, imitating them, proposes the drug as a substitute for the preparations of arsenic in certain squamous affections, such as psoriasis and lepra vulgaris. He gives each day from one to three large spoonfuls of the following mixture: subcarbonate of ammonium, 2 grammes (gr. 30); sudorific syrup of the Codex, 200 grammes (about ℥ viss.). After from three to eight days the scales fall off, and the fresh scales become more and more light and thin; the plaques on which they rest waste, the redness is extinguished; and at last the cure is complete, and often permanent ("Annales des mal. de la peau," oct., 1851).

M. Guérard has revived the use of this salt in acute and chronic pulmony catarrh; his dose is 1 or 2 grammes (gr. 15—30) in a draught.

Acetate of Ammonium.

What we have just said of carbonate of ammonium may be applied to the acetate. But we cannot pass without referring to what Boerhaave, Cullen, Selle and so many others say of spiritus Mindereri. These writers, and our own contemporaries, agree in ascribing to acetate of ammonium the property of making the circulation, the secretions, etc., more active—a property which it shares with the volatile alkali (Cullen: "Mat. med.," t. II., p. 366; Selle, "Obs. de méd.," p. 70). As regards the effect upon intoxication (Mazuyer: *Gazette de santé*, nov., 1826), migraine (*Ibid.*), and the uterine pains which accompany menstruation, it has no special property beyond what was stated under ammonia. But the acetate of ammonium has lately been used in a more special way as a uterine sedative. M. Patin has reported cases which tend to show that in excessive or too frequent menstruation, or uterine hæmorrhages, even if proceeding from cancer, this remedy diminishes the amount and frequency of the discharge. It is then given in the amount of 15 grammes in the 24 hours, in 4 doses. The same physician says that acetate of ammonia has often succeeded in his hands with cases of difficult and painful menstruation, causing the pain to cease and assisting the flow. From 50 to 75 drops may be given, divided into two doses and mixed with a glass of sweetened water. As soon as the pains and disturbances of the menstrual period appear, the first dose is given, and the second, if necessary, half an hour later. The amount may be increased according to the severity of the symptoms.

He also reports a case of nymphomania very beneficially treated by this remedy. He adds the inference, that acetate of ammonium might be very useful to women disposed to abortion owing to determinations of blood to the uterus; in inflammations of the uterus and ovaries, and in organic lesions of the same parts (*Arch. gén. de méd.*, t. XVIII., p. 217).

Muriate of Ammonium.

This compound has no special virtue distinct from that of the others, as may be seen by referring to Frederick Hoffmann's and Arnold's remarks on its influence on the pulmonary secretion (*Journal complémentaire*, t. XXVI., p. 300), Kortunn's and Kuntzmann's on its efficacy in rheumatism, etc. We shall only say that it was formerly much used in the treatment of intermittent fevers (Stoll), but usually in conjunction with cinchona or some bitter.

Nevertheless, we will not omit the use made of it by Dr. Fischer in spasmodic dysphagia. He gives a dose of 125 centigrammes (gr. 20) every two hours, and in the case reported by him it was continued for eleven weeks (*Arch. gén. de méd.*, t. II., p. 118).

Bronchitis.—Muriate of ammonia has a very high reputation in Germany as a resolvent in chronic bronchitis.

Dr. Delvaux, of Brussels, says that he has found it very useful in the dose of from 1 to 3 grammes (gr. 15—45) in the 24 hours. It usually causes a great sweating, and abundant urine; while the dyspnœa diminishes, the cough becomes less fatiguing, the expectoration easier and less abundant, and the appetite soon reappears (*Journal de Bruxelles*, 1854).

M. Marotte speaks well of its effects when substituted for sulphate of quinia in catarrhal affections. He sums up his results as follows:

In the immense majority of cases, catarrhal affections affect a periodicity, taking the type of continued remittents or intermittents, quotidians, double tertians or hemitrits. This has been known from their earliest history, and has no novelty. Nor is there anything new in the comparison which has been made with paludal diseases.

The observation of the causes under which they develop is sufficient to prevent confounding them with the latter. These special causes explain why catarrhal affections, although usually controlled by cinchona, and especially by sulphate of quinia, on account of their periodicity, are not so absolutely nor so easily controlled by it as affections of paludal origin. They may give to catarrhal affections a character of tenacity and fixity which sometimes makes their course continuous, and resistant to quinia, even when they seem to be periodic. This is fully proved by the history of "medical constitutions" [*i. e.* epidemic conditions] and of general epidemics.

There is no uniform specific treatment for catarrhal affections; they are cured by obeying the indications as they arise.

The present epidemic (1867) proves that catarrhal affections may be made less tractable, or wholly intractable, to sulphate of quinia, by an inflammatory erethism, which doubtless originates from the general preponderance of cold in the midst of other conditions suitable to engender it.

Whatever may be the value of this morbid determination and of this indication for sal ammoniac, and whatever the results of further observation, it follows from facts observed in the present state of constitutions, that muriate of ammonium may become a useful substitute for sulphate of quinia in catarrhal affections. (*Académie de médecine*, avril, 1867).

Senile gangrene.—A woman aged eighty-three was suddenly seized with intolerable pain in the right foot; eighty-four hours later, there was a general blue-blackish tint, stopping at the tibio-tarsal joint, where a red stripe indicated the demarcation. The foot was perfectly cold. Dr. Gru at first used preparations of opium in enormous doses, but the pains continued and the patient seemed in despair. He then put 250 grammes (℥ viii.) of muriate of ammonium in a foot-bath reaching to the malleoli, and plunged the affected foot in it. In two hours there was considerable relief. The bath was then replaced by fomentations with the same solution, and the patient insisted on their retention, for, as often as they were taken off, the pain reappeared directly. The normal warmth

and color soon returned under this influence, the nail of the second toe fell off, and a small sore was formed which healed in three weeks.

A year later, the same precursory signs appeared in the same foot. This time, muriate of ammonium was used at once, and its sedative properties were felt immediately. A blackish blister appeared on the outer border of the foot, covering a gangrenous patch which fell off, and the sore healed in twenty-one days. No further trouble of the sort has since occurred.

This action has never before been mentioned; let us hope that it will be confirmed by fresh cases (*Bulletin médical de l'Aisne* and *Gazette des hôpitaux*, 15 juin, 1867).

Articular rheumatism.—M. Dujardin-Beaumetz, having sought to introduce the hydrochlorate of trimethylamin in the treatment of this disease, desired to see if the muriate of ammonium, which closely resembles it in chemical composition, had similar properties. His experiments on the guinea-pig, rabbit, and frog, showed him that muriate of ammonium injected into the subcutaneous cellular tissue of these animals produced convulsive shocks and speedy death; the muriate of trimethylamin appearing much less poisonous. These experiments are not very applicable to therapeutics; they may serve to warn physicians of the danger of such injections, but have no bearing upon the administration of the salt by the mouth; in fact, a dose of ten grammes (ʒ iiss.) of the salt of ammonia thus given has produced no such result (Sociéte de thérapeutique, 14 mai, 1873).

M. Martineau has used muriate of ammonium in the dose of ½ gramme daily in solution in a julep, for cases of acute articular rheumatism. The 14 patients thus treated seemed to him to recover as quickly as with muriate of trimethylamin. M. Delioux de Savignac objects to these optimistic conclusions, that half a gramme (gr. 8) is a very small dose of a drug which is constantly given in doses of 60 grains and upwards. It is to be feared that the real result is not so favorable as M. Martineau seems to think.

Phosphate of Ammonium.

This salt has been recommended by Buckler, of Baltimore, as very efficacious in gout, rheumatism, and all acute or chronic diseases depending on the uric acid diathesis. MM. Edwards, and Mattei of Bastia, support this opinion. M. Delioux de Savignac, "Dict. encyclopédique," art. Ammoniaque, says that in his experience, in acute articular rheumatism treated with this remedy, the urine became limpid and ceased to deposit uric acid. The salt has been given in the dose of from 2 to 16 and even 20 grammes (ʒ ss.—ʒ v.) in diabetes mellitus (Bouchardat).

Valerianate of ammonia.—This is recommended by Pierlot; and Moreau of Tours, and Mesnel consider that it fills a certain place in neuroses. Dose 4 grammes (ʒ i.) per diem in liquid.

Chloride of Sodium.

Diabetes.—Nasse proved that the blood in glycosuria contains less salt than normal blood, and Thierfelden and Uhle, that the urine contains an excess; for this reason, sea-salt has been given, in the hope of repairing the losses which the system experiences, if not of curing the disease. This was done in 1842 by Martin Solon, then physician at the hospital Beaujon; but his results were inconclusive. Coutant ("Thèse de Paris," 1844) and Bouchardat ("Mémoires de l'académie de médecine," 1851, p. 190) repeated the trial; the latter recommended salted meats to diabetic patients, but the effect of the meat was transitory, and was limited to a diminution of the thirst.

Phthisis.—M. Amédée Latour having heard from a keeper of monkeys that he preserved his beasts from having phthisis by giving them sea-salt, made the experiment in his own practice, and published two mémoires, in 1857 and 1859 (*Union médicale*). In his second paper his views had greatly changed; for he no longer gave chloride of sodium, but the milk of a goat which had been fed with salt; this increased the appetite and lessened the sweats.

We believe that chloride of sodium in such cases is a more powerful reconstituent than iron or iodine. It has no action on the respiratory system, but it aids nutrition, that is, assimilation. For this reason we advise phthisical patients to salt their food, especially their meat, while eating it.

Paludal intoxication.—In 1841 chloride of sodium was recommended as a febrifuge by Piorry (Académie de médecine) and Gintrac père, of Bordeaux, and in 1851 by Bruys, of Bruges.

To give value to any trial, it should be made in a fever district. Dr. Larivière used it at Batna (*Union médicale*, août, 1851), where he gave it to 52 persons; he concludes that salt had a certain action on his patients; that he had cured the accesses in some, and in others had restored the appetite and removed the paludal anæmia and cachexia. It is then inferior to sulphate of quinine, but may in part take the place of the latter when wanting. This occurred to Dr. Pioch, when in 1870 he received in the camp at Sathonay some soldiers suffering with African fever; having no sulphate of quinia, he gave chloride of sodium in the dose of 10 grammes in half a glass of liquid twice a day. When increased beyond this quantity the medicine purged, and had to be stopped.

Cholera.—In the epidemic of 1831 Dr. Ochel believed that he found sea-salt useful in cholera; but Récamier, in 1832, Stevens, in 1849, and Aran, in 1843, used the same, with only doubtful results.

More recently, M. Lorain and Dujardin-Beaumetz have repeated the trial, by injecting salt into the veins; under the influence of this active treatment the patients, even in the algid stage, have been seen to grow warm, to cease vomiting, and even to begin to eat.

Intestinal worms.—All who have had to treat this trouble have found it somewhat difficult. We would ask attention to this harmless, cheap and accessible remedy, which has been used by M. Lecœur of Caen, in the form of an injection. He gives half a gramme (gr. 8), and finds that one injection almost always kills the oxyures, and more than two have never been needed.

External Action of Chloride of Sodium.

All who have written on warm sea-baths, as Gaudet of Dieppe, Roccas of Trouville, Joubert of Villers, etc., confirm our account regarding the physiological action of this salt. The following is a statement of the results obtained by Dr. Bergeron at the hospital of Berk-sur-mer in the Pas-de-Calais, from July, 1861, the date of his installation, to Dec. 31, 1865:

During this period 380 scrofulous or rachitic children were sent to Berk by the hospitals of l'Enfant-Jésus and Sainte-Eugénie, and by the Service des Enfants Assistés, from Paris and from the arrondissements near that of Montreuil. The average period of residence of these children was nine months. Some, who had a mild form of scrofula, remained at Berk only six or eight weeks; others, who presented a deep and obstinate form, the cure of which required a real transformation of the organism, passed more than a year there.

In the earlier part of this period, says M. Bergeron, for want of experience to guide in a selection, all the forms of scrofula were sent, from scrofulidæ of the skin and mucous membranes to the most profound caries, and even necroses consecutive to suppurative periostitis; but by degrees it was found that while all the children derived the greatest benefit from the vivifying effects of the baths and the air, there were certain local lesions which were but slightly affected, or even were made worse, while others were absolutely obstinate to this influence. For instance, chronic blepharitis, and, in general, diseases of the eye and eruptions of simple and impetiginous eczema, were rarely improved, and usually made worse, while otorrhœa without osseous lesion, extensive caries, and profound necroses, remain stationary indefinitely. From that time the indications were clearly traced. For the last three years, the cases preferred were those of enlarged glands, cold abscesses, scrofulous gummata, white swelling, and rachitis.

Of 380 children sent to Berk, 118 had chronic adenitis, chiefly of the cervical and submaxillary regions; usually consecutive, either to eruptions of the face or scalp, which mostly disappeared at the moment of departure for the sea, or else to old deep lesions of the limbs or trunk. These 118 presented all the varieties of chronic adenitis, from recent simple engorgement without induration to glandular masses infiltrated with tubercle, with or without ulcers of the skin. Scrofulous adenitis is notoriously an obstinate complaint under any treatment. Of these children 85 were

completely cured, excepting one who succumbed to a cachectic condition which was not arrested by the influence of the sea; while all the rest improved, and would no doubt have greatly increased the number of cures if they had not been sent back prematurely for divers reasons.

The saline air has not the marvellous power of dissolving cretaceous indurations and producing immediate cicatrization of scrofulous ulcers. M. Bergeron does not hold such a view; but it seemed to him that simple indurations, however old and indolent, recovered under this influence more rapidly than when treated by the usual drugs, and that cervical or submaxillary glands which were completely transformed into tuberculous nodules had sometimes disappeared, after a long period, without leaving any traces beyond a movable indolent induration.

"I have seen several such cases," says he, "among the patients at Berk; and while these facts are not new, they deserve to be noted as showing how great benefit may be derived from saline waters in the treatment of certain cases of tuberculous adenitis, which are so seated as to become far more dangerous than those seated subcutaneously; I refer to mesenteric and tracheo-bronchial adenitis."

We give some of the results in the worst forms of scrofula, particularly of the long bones and the peri-articular soft tissues.

There were admitted to the Berk hospital 85 children with white swelling, most of them in the way of recovery, while others were in a stationary condition, in spite of the most rational treatment, and others were in a desperate state, as regards the preservation of the limb. Of these 85 patients, 4 died, 3 from excessive suppuration, and 1 from a complication of visceral tuberculosis; 13 left Berk without sensible improvement. Of the 18 who returned to Paris incompletely cured, but so far improved that a cure could confidently be expected, there were several whose cases were very interesting. "Coming to the sea-shore in a pitiable condition, from general exhaustion and grave local disease, little by little, under the influence of a revivifying atmosphere, these unhappy beings felt their appetite returning, their strength renewed; the swollen joints soon began to lessen in bulk, the suppuration became less, and most of the fistulæ healed; sometimes the joints even recovered a part of their mobility."

Of 38 patients with Pott's curvature, 12 returned completely cured; the iliac abscesses were absorbed, the general health was perfect, and the walk was as free and easy as the curvature of the spine permitted. Two children sent back as cured returned after five and seven months with new collections of pus. Seventeen others who, for divers reasons, left the place prematurely, were improved in general health, but not cured, some of them with a commencement of absorption in the "abcès par congestion." Six went away without any benefit, and three died from excessive suppuration.

Of the entire number of 380 cases, 284 recovered, or 74 per cent.; 93 were improved, or 24 per cent.; 18 died, or 4.7 per cent., and in 35 the

effects were null, 9 per cent. These figures place the power of the sea-treatment beyond a doubt.

Such are the chief indications for sea-baths; for the rest, we shall note here only those diseases which are not benefited by cold sea-baths, but may be improved by warm sea-baths and water containing common salt.

Lymphatism.—Scrofula.—Rachitism.—Children under three years of age cannot take surf-baths without danger, while warm sea-bathing does them the greatest good, and assists the action of the sand-bath which they take all day in playing on the beach.

Among the scrofulous affections, those which are most benefited by water charged with chloride of sodium are the chronic adenopathies, articular and osseous lesions, and inflammations of the ocular, palpebral, and nasal mucous membranes, and scrofulidæ of the skin. These affections are advantageously treated by warm sea-baths at the establishments of Salies, Bourbonne, Balaruc, Salins (Jura), Lamotte, and Kreuznach.

Atony.—Senile debility, and that due to any physical exhaustion, are greatly improved by baths of warm sea-water; and the same is the case with the debility of pregnant women and of those who are fatigued by successive pregnancies or nursing.

Uterine affections.—Nervous or inflammatory hysteralgia is relieved in a remarkable way by baths of warm salt water like those of Bourbon-l'Archambault.

Rheumatism.—Patients subject to the rheumatic diathesis and who suffer from atonic rheumatism, or from catarrhal susceptibility, obtain from salt water a power of resistance which enables them for a time to avoid these complaints. This property of the chloride of sodium waters is best found in those of Salies and of Bourbon-l'Archambault. At Bourbonne very good effects have been noticed in dry arthritis.

Paralysis.—The stimulant action of chloride of sodium waters on the periphery, aided by their laxative action, has helped hemiplegic patients in recovering movement, after apoplexy or paraplegia. Those which have the best reputation in these cases are the waters of Bourbonne, Bourbon-l'Archambault and Balaruc. The same is true of muscular and articular stiffness, following fractures and wounds in war.

Alterative Treatment in General.

There are certain agents of the materia medica which have only a transient action upon the system; the modification seems to have affected the nervous system only; a few moments, hours, or days efface all traces of the passage of the remedy. In this category we place the irritants and the escharotics, which, while causing an active or local disturbance as forcible, do not strike to the inward parts of the system, and limit their action to a short range.

Others there are which bestow on the organic elements something which remains, which survives the original impression; it may be a constituent element or an improved functional aptitude, and then the remedy is called an analeptic or reconstituent; it may be that the blood and the humors are altered in kind, are made less fit to aid in the act of nutrition and to furnish materials for acute or chronic phlegmasiæ; or act by preventing the generation of secondary accidental products; the latter class are called alteratives.

In the case of diseases which hardly modify the system, or which occupy an organ of minor importance, it is easy to see that a superficial treatment, if we may so speak, is sufficient to cure; but when the system is deeply affected, when an extremely important organ is touched, or a great number of local lesions are equivalent to one lesion of great extent; or when a disease, chronic in its progress and its form, rebellious and tenacious in its nature, has become rooted in the system, a more energetic resistance must be made to the more vigorous atack; and then it is that we have to use agents which cause deep modifications.

At the head of alterative remedies we must place bloodletting. This practice, which we shall study especially under antiphlogistic treatment, not only despoils the vascular system, and in consequence all the tissues to which the latter carries life, but it changes the intimate composition of the blood, as we shall show later. But though often applicable in acute conditions, it cannot be denied that this remedy is usually inadmissible in the chronic state; frequent and long-continued bleedings would compromise the general health too much. We have then to recur to agents which modify the blood without entirely destroying the reparative elements it contains. Such agents are the alteratives.

The alkalines occupy a place among these remedies which is certainly as important as that of mercury, to which, as to iodine and arsenic, we have given much attention; we must here devote a few lines to their study.

Such is the importance of the alkalines, that they may be said to be as necessary to the accomplishment of certain functions as oxygen is to respiration.

If, now, it be necessary to define the mode of action of these agents, and their special rôle in the economy, we should say that our modern physiologists consider the alkalines as indispensable to the phenomena of endosmosis, combustion, digestion, and the secretions.

Thus, they are believed to contribute to maintain in the blood that degree of viscosity which is necessary to render it fit for endosmosis, exosmosis, and the various compositions and decompositions which constitute organic life. They enable the saccharine and amyloid foods to unite with oxygen, and to assist in the functions of respiration and calorification. They make the elements of the bile fluid, prevent them from inspissating and forming concretions or calculi. Let us add that they emulsionize and saponify the fatty matters, maintain the intestinal diges-

tion, facilitate secretion, and thus actively co-operate in all the acts of nutrition and assimilation.

Whatever may be the value of these physiological interpretations drawn from chemistry, it is very certain that the alkalines have an immense influence upon the system, by the same title with the acids; and it could not be otherwise. The blood is naturally alkaline in a certain fixed degree, whereby it is made able to distribute special chemical qualities to the various secretions. Of these, some are slightly alkaline, as the saliva and pancreatic juice; others are so to a very high degree, as the bile. Others are very acid, as the urine, sweat, and gastric juice. If the blood is rendered more alkaline by the use of alkalis, there will come at last a special condition of the blood, a new state of the secretions. Those which are naturally alkaline or neutral will increase in alkalinity; those which are acid will become less so, or will be neutral or alkaline. These are necessary chemical effects. If the presence of acids is a necessary condition of the stomach-digestion, it cannot be a matter of indifference to neutralize the acids. Furthermore, chemists say that a correct proportion of alkalis in the blood enables this liquid to consume in due proportion the carbonaceous elements absorbed in the act of digestion, such as sugar, fats, alcohol. An incomplete combustion would doubtless produce the evils of which we shall presently speak; but excessive or too rapid combustion is equally dangerous, as causing important changes in the composition of the blood, and therefore in the texture of the organs.

If this be true, the giving of alkalines, in health or in sickness, can never be a matter of indifference. If taken without good grounds for a short time only, they do but momentary harm; if taken largely and long, they cause a deplorable cachexia and emaciation.

The influence of alkalis on the composition of the blood was admirably stated by the ancients. They had seen that this nourishing fluid became paler and more fluid; and that at last a state of cachexia was established, characterized by pallor, general puffiness and passive hæmorrhages; emaciation, often irreparable, followed. The excessive use which has lately been made of the waters of Vichy, Carlsbad, and Pougues in treating gout, has furnished illustrations of this point; we do not fear to say that the abuse of alkalines has caused more harm than the abuse of iodine.

When in an acute disease we wish to produce in the crasis of the blood a rapid change analogous to that caused by bleeding, we use mercurials, especially calomel, by Law's method, as described above; but when there is a chronic disease of the liver or a diathetic disease with a real or supposed predominance of acids in the secretions, such as gout, we must use the alkalines—taking care not to pass beyond our aim.

The attacks of gout are certainly lightened by using the waters of Pougues, Vichy, or Carlsbad with perseverance; the formation of uric acid gravel in the kidneys may be prevented with still more certainty by the same remedies; but to extinguish the symptoms of gout is not to cure

gout, any more than driving away cutaneous eruptions by local remedies is curing syphilis. The diathesis is so persistent that the attacks will return unless the patient places himself under special hygienic influences. It is doing a great deal to make the attacks less frequent and acute, but if we undertake to destroy the diathesis, as certain ignorant physicians profess, we undermine the foundations of the constitution, and the abuse of alkalines brings on the cachexia of which we lately spoke, a morbid condition much more grave and incurable than gout and gravel.

The liver swells and becomes fatty in animals fed on highly carbonized food and kept inactive. We know that exercise is one of the best means of assisting the destruction of the carbonized principles, especially fat; we know also (and here the chemical theory agrees with clinical experience) that the consumption of alkalies and the consequent alkalization of the blood usually hastens this destruction and supplements an inactive respiration. It is well established that the alkalines diminish the coagulability of the blood; and it would seem, though we by no means affirm it, that in attacking the albumin and fibrin directly they acquired the power of dissolving the two chief basal elements of most chronic engorgements. This property is most remarkable in the case of hepatic engorgements, vulgarly called obstructions. Theory, then, would have led to the use of alkalines in chronic disease of the liver, even if practice had not decided hundreds of years ago.

But the alkalines must not be abused. Physicians do not sufficiently bear in mind that the inherent properties of the living tissues enable them to resolve engorgements when the first impulse has once been given. In bleeding for pneumonia, we suppose that we are removing the excess of blood from the lung: this idea cannot be entertained by any one who has any notion of physiology; it is rather that, after the bleeding, an obstacle to the performance of the nutritive functions of the pulmonary tissue is removed, and resolution is effected by virtue of properties inherent in the tissue of the lungs, without subsequent medical interference.

The obstacle which is sometimes removed in one instant in acute disease can only be destroyed slowly in chronic disease; but when removed, the properties of the tissue resume their rôle, and the physician should be simply an attentive and intelligent spectator.

This should enforce the precept which we just gave, to wit: that in treating chronic disease of the liver we must stop the alkalines as soon as resolution of the engorgement fairly begins; not pursuing the disease, which is bound to get well without us.

A neglect of the natural powers of the tissues is the reason why so many physicians use alkalines too long in complaints of the liver. A person feels a little better on returning from Vichy, Pougues, or Carlsbad; his health is confirmed during the winter. He thinks it necessary, in order to prevent relapses, to take the waters several months, for some years in succession; but instead of the former benefits, he gains only discomfort, and sometimes serious trouble, which he ought to ascribe, not to the ob-

stinacy of his disease, but to his blind persistence beyond the point of usefulness.

How is it that physicians do not see that a remedy which is powerful to cure must be powerful to do harm?

The alkalines are given with singular levity. A month or two of the water of Vichy, Carlsbad, or Pougues is prescribed as one would order a ptisan of barley or borage; but is it of so little consequence, to alter at one blow all the secretions of the body?

Other alterants are usually handled with more prudence; mercury is considered a serious thing, because its danger is understood a little better. And so with iodine.

Yet, how many physicians in constitutional syphilis give mercury with deplorable persistency, following on the heels of every symptom, and never thinking the disease overcome till the periostoses are entirely gone, and the necrosed portions of the palatine or ethmoid have all fallen!

The general conception, more or less vague, of a specific is that it goes directly at the principle of a disease, and neutralizes it directly by its own force. The laws of the organism do not apply to it. It is neither by a stimulant, sedative, cold, hot, dry, moist virtue, nor by any other particular property, that it acts specifically; but, as Galen says, by its whole substance. Cinchona cures intermittent fever, not because, as some say, it is tonic—or as others say, sedative, astringent, and mummifying, stomachic, diaphoretic, antispasmodic, etc. No; between the cause of intermittent fevers and cinchona there exists an incompatibility in which the disease succumbs, as in the case of two botanical or zoölogical species which cannot live together, so that one always destroys the other. Mercury does not cure syphilis because it is acid or alkaline, antiplastic as is now said, or coagulant, as was formerly thought. It acts on this disease as blue ointment does on lice—it kills it. The organism has no chance to interpose in the action of cinchona or mercury: it contains certain entozoa, which the drugs poison, and that is all. The poison acts by affinity; without injuring the organism, it exterminates the parasite as in a test-tube. This is of course very simple; the disease is not so mysterious as had been supposed.

We beg to call attention to one point: in this theory the disease is confounded with a morbid product. It is compared with something contained in the system, as the worm is in the intestine, or mechanically mingled with the blood, or extravasated in the tissues. This is the interpretation given by humorism; the uselessness of the organism during the action of the specific is manifest. Everything occurs in it, yet without its action. Who is bold enough to sustain this theory? Professed or not, expressed or implicit, it is nevertheless that of the immense majority of physicians, and almost all our pathological and therapeutical writings presuppose it. It is as pregnant with dangers as with errors.

The specific remedies have no other general method of action than those which are not specific. In brief, they act either with the assist-

ance of life or without it. To its acting without life there are grave objections.

Mixed with mercurial preparations, the syphilitic virus is most positively inoculable. Taken before the development of visible syphilitic lesions, mercury does not prevent them. This might excuse us from finishing the refutation. Syphilitic and mercurial symptoms pursue their way together in the same person without influencing each other at all. The mercurial not unfrequently aggravate the syphilitic symptoms, adding their own characteristics and producing a mixed affection, a syphilitico-mercurial cachexia, which is very hard to cure. Finally, by the side of persons whom mercury cures of ordinary syphilis without producing any appreciable mercurial symptom, there are others in whom the disease pursues its ravages undisturbed. Add another very common case, and we have all that are possible—the appearance of mercurial accidents simultaneously with the disappearance of those of syphilis. Considering this diversity of the relations between the two series of symptoms, one venereal and the other mercurial, what is the meaning of the cases in which a mercurial modification, whether appreciable or not, dispels the symptoms of syphilis?

Singular contrast! Mercury arouses in the healthy tissues alterative, antiplastic, exulcerant actions; and in tissues devoured by syphilis, plastic and separative actions. What was the cause of destruction in one case is the cause of regeneration in the other; and it is the same mode of irritation that produces such opposite effects! How can these contradictory properties be ascribed to one modifying agent, if its scope be limited to its action as an antidote, which neutralizes a poison by forming with it a harmless compound? To respond by ulceration and by cicatrization to the same influence is a proof of capacity for two opposite effects. They do not proceed in reality from the mercury, but from the organism as impregnated with the virtue of mercury. Our body then contains morbid properties which mercury brings to activity by the effect of certain qualities which belong to it alone, and which may be called specific qualities, if we do not attach to the word an occult and reserved sense, but which we prefer to call simply mercurial. Every body in nature has properties which none other possesses, and in this respect mercury forms no exception. The tonics and the emollients, water and wine, are in this respect as incomprehensible as mercury.

The system cures syphilis under the influence of mercury. We must keep ourselves within this idea. Nitrate of silver applied to a chancre cures it perfectly: shall we infer that it is a specific in syphilis? Who does not see that this agent merely excites a morbid vital action or an irritation which is different and less injurious, and is spontaneously cured? If mercury be the counter-poison of syphilis, why does it not always neutralize it? It will be replied that it does this, when syphilis is free from other pathological elements. We may as well say, with Hunter—who was, nevertheless, an exaggerated partisan of mercury—that mercury is

the antidote or specific remedy of the venereal disease considered abstractly. And yet, spite of his fanatic attachment to mercury, Hunter regarded its action as a vitalist would. Our present object is simply to apply the general laws of all medicines to the specific remedies, which are always represented as more mysterious and extraordinary than the others; and to prove, further, that their exceptional efficacy in various diseases depends upon certain exceptional peculiarities in the diseases quite as much as on the intrinsic power of the remedy.

The organism, excited by food, draws from it the various components of the body. It stands in the same relation to remedies, educing their properties, developing and vivifying them; for through it they become alive, or life itself modified in various ways. It assimilates or makes similar to itself a part of these foreign forces. They pass into it, it raises them to its order of activity. It transfers them, not by juxtaposition, but by intussusception; and it then draws the remedial action from itself, "ab intus suscipit." A living mirror of the properties of these poisons, one may say that it becomes successively opium, mercury, cinchona, antimony, belladonna, etc. It is, if we choose, opium, mercury, etc., in a more elevated order of activity, more truly representative of their essential properties, which live for a moment a superior life, and are for a moment in a certain sense animalized. There are neither metaphors nor comparisons here, but the most absolute physiological rigor; we are at the root of therapeutics. Vitalism rescues toxicology from the lower region of retorts and alembics; and, without breaking with tradition, but largely supported by it, raises materia medica to the dignity of physiology.

The specifics and their type, mercury, can claim no exception. The healthy organism must consent to its physiological action; and to the latter, the syphilized organism must consent. There is no more chemical action in this than in nutrition or conception, and we may say in full strictness that, in order that mercury shall act, the syphilized system must conceive the properties of mercury, just as, in order to contract syphilis, it had to conceive the syphilitic virus. But the latter acts on the system more profoundly than mercury, for it is a product of the system, a more intimate morbid poison than any other. Mercury does not thus affect the system in its essence; it modifies the nutrition and secretion transitorily, and thereby affects the deviations in their functions which the venereal poison occasions. But these symptoms presuppose invisible roots to the malady. Mercury, a body not homogeneous to our own, seems unable to pursue the initial living cause of syphilis thus far—or, if it does so, it seems unable to identify itself with the system. Mercury, then, attacks the symptoms and not the principle. But what a specific, even from this aspect! And is it quite true that it cures all the symptoms so wonderfully? Here, perhaps, we touch the secret of mercury.

Mercury is most efficient in one phase of the venereal disease, that of the secondary symptoms, which affect chiefly the skin and mucous membranes. It is at least useless in the primary symptoms; taken then, it is

not proved that it prevents the development of secondary symptoms. Finally, its efficacy diminishes in proportion to the remoteness of the primary impregnation; and in the third order of symptoms, those of the deeper organs, bones, the weakly vitalized white tissues, its therapeutic activity is so weakened that it loses a great part of its privilege and yields its specific virtue to iodine. Let us mark well, that in the period when we may usually do without mercury, it is no more a specific than nitrate of silver or any other substitutive modifier. When the disease has struck deep root, and is hard to tear out, and has intimately altered the constitution, mercury is of hardly any more value than in other non-venereal affections of the same parts, and iodine easily contests its superiority. The time of its triumph is the intermediate period, which, of all the non-organic affections of our tissues, is the most mobile, the most diversified, the most modifiable, the most alterable. For incurability, it cannot be compared with cancer, tubercle, etc. Now, mercury is the most potent of alteratives. How do we know that its specific virtue is not due to this alone? Why should so singular an anti-venereal power fail in deeply rooted syphilis, and sometimes in that which is not yet rooted? Why, after one mercurial course, can we never be sure that a second or third attack will not appear, and infect the descendants? And if mercury is a specific in the scholastic sense, why does it demand the hygienic and therapeutic conditions which all diseases and treatments require? Does it cicatrize? Physiologically, it causes ulceration. When the organism is unsound, the syphilitic accidents are ill-defined, depraved, lose their specific distance, as Hunter said; in a word, have no tendency to spontaneous cure. Mercury too often increases this unhealthy disposition. The organism must be modified in order that this famous specific may regain its power, which is called so direct. In certain very irritable persons, opium must be added to it, or it will not act, or will do harm rather than good. At other times tonics must be used simultaneously in order to insure success, or, it will cause an increase in the venereal symptoms, unless its administration is preceded by venesection, etc. It is exactly as in the case of remedies which are not in the least specific. It must have the system at its disposal, just as if it were a common remedy. Therefore, it does not act alone; it does not neutralize the principle of the disease by an immediate and specific action, in the sense of the schools. Nothing is more conditional than its effects.

Syphilis may recover spontaneously at a certain stage; and it recovers under the influence of mercury. But the mediate causes or conditions of cure may be very various; its immediate and efficient cause, its principle, if we choose, cannot differ from itself; it is one and identical with it. Now, syphilis recovers spontaneously, or rather, the organism cures syphilis by its own power; therefore, it cures syphilis when mercury is given. We also conclude that it is impossible that this should be otherwise, according to the physiological laws which we have stated, and which govern all treatment.

The indication for alteratives occurs in acute and chronic disease.

1. *In acute disease.*—We have said that alteratives are in place at the beginning of an acute disease, when it is necessary to modify the crasis of the blood almost instantly, as venesection does it. There are two sorts of these alteratives; the one class liquefy, attenuate the blood directly and without previous excitement; these are mercury and the alkalines; the others, before producing their effect, cause a general excitement, which is active in proportion to the promptness with which the effect is sought; these are arsenic, iodine, gold, and platinum. The latter should never be used in acute diseases.

As regards mercury and the alkalines, with which we might class nitrate of potassium, they act as alteratives without intermediate phenomena, almost as venesection does. For example, mercury in puerperal peritonitis, synovial rheumatism, and frank acute inflammation of the parenchyma and the membranes; and the alkaline salts of sodium, carbonate of potassium, and especially nitrate of potassium in very high doses, in the same circumstances.

These three agents must not be used indifferently, for their range is far from being the same. Mercury alters the constitution profoundly, sometimes leaving traces which last for months; the others act immediately with almost the same energy, but in a few days after they are given the system forgets them, as they are easily assimilated or eliminated; nor is the enfeeblement they produce so complete. Hence, the two latter are to be preferred when it is to be feared that the constitution may give way as soon as the inflammation has gone; the former, when the patient is vigorous, the reaction sustained, or the disease one which may be expected to continue.

In typhoid affections (by which we mean not only dothinenteritis, but all disease accompanied by typhoid accidents) we are especially afraid of remedies whose action is prolonged, such as mercury, and for a very simple reason. Bleeding and alterants fulfil well the indication for depression in cases of excessive reaction at the beginning of such a disease, but bleeding and mercury are agents whose effects are protracted; and if the period of stupor and debility presently comes on, we shall find ourselves deprived of the power of restoring the system to a type of energy suitable for overcoming the malady. We cannot then restore the blood in one day, nor relieve the system of the mercury, with which its tissues are impregnated, and which so profoundly debilitates it. In this case mercury and bleeding should be continued for only a very little time; they should be stopped as soon as the inflammatory orgasm begins to yield.

2. *In chronic diseases.*—When a disease has struck deep root, when the symptoms increase slowly or remain stationary, when the vital organs are involved, or a local affection threatens to become generalized, it is most necessary to insist on remedies to relieve the cause of these affections, or their effects. Sometimes the alterative treatment attacks and neutralizes the cause, and the lesions produced by the cause are after-

wards cured by nature's efforts; sometimes the cause dies out for some reason which we may not recognize, leaving traces of its action which are not cured spontaneously, or only after a long time, and an alterative relieves these after-effects without generally attacking their cause. Thus, mercury, gold, and iodine seem to have a power of rendering the cause of syphilis harmless, while iodine and gold seem to take hold only of the consecutive symptoms. In more exact terms, these remedies do not destroy the cause of syphilis when it is evidently present, but destroy the symptomatic accompaniments; whereas, during the age when scrofula is making progress and consequently is a real existent cause in the system, these remedies seem much less efficacious than at the period when nothing remains to be attacked except the organic changes which have been caused by successive attacks of the scrofulous distemper.

There is something quite direct in the action of alteratives on a dyscrasia or a virus; there is nothing visibly interposed between the cause and the effect. The behavior of the remedy to the system in health gives no indication of its curative power in syphilis or scrofula; but it is otherwise when we consider them independently of their specific mode of action, and as related to the common chronic affections. We can comprehend, up to a certain point, the mechanism of the Vichy waters in certain engorgements of the liver.

In certain diseases there is a great disturbance in the chemical constitution of the fluids of the body. Diabetes mellitus is an instance. The blood, in this affection, is a little less alkaline than in a normal state, the salivary fluid becomes acid, and by virtue of the tendency of the system, starch is converted into glucose on entering the stomach, more quickly and completely than is natural; and the absorbed glucose, circulating in the vessels without finding sufficient free alkali undecomposed, passes into the urine in the condition of grape sugar, having first, by its contact with all the organs, produced severe functional disorders and a cachexia which at last betrays itself by very severe organic lesions.

When the disease is not very far advanced, the use of alkalines, especially the bicarbonate of sodium and magnesium, is almost certain to prevent the saccharine transformation, or at least permits the sugar to be assimilated and decomposed in the current of the circulation in such a way as not to be passed by the urine; while at the same time the thirst diminishes, the perspiration and the strength reappear; and to-day, thanks to this treatment, there are a considerable number of cures, more or less complete, of a disease formerly thought to be almost beyond the resources of art.

Must it be admitted that many chronic diseases, and even some acute ones, may be considered in their local expression as the result of an accidental product analogous to mould, fungi, or lichens?

It certainly cannot be denied that the disease in general causes in the system certain alterations which have some analogies with the lower orders of the animal, and even of the vegetable kingdom.

These low organisms germinate in the system at the expense of fluids altered by disease; they develop on the surface or in the substance of tissues, and form local lesions which cause mechanical impediments, and become foci of malignant phlegmasiæ, which multiply themselves indefinitely as by a sort of fermentation. This pathogeny is easily demonstrable in most of the diseases of vegetables; perhaps it will one day be regarded as not wholly absurd in respect to men and animals.

This idea may form a tolerable basis for explaining how alteratives act in certain chronic diseases, such as dartres, cancers, scrofula, syphilis, the causes of which may be more or less profoundly modified by mercury, gold, arsenic, iodine, etc. Our remedies act on these diatheses as upon the diseased surfaces of living animals, where cryptogams are forming.—How, then, do they cure these last degenerations locally? They probably do it by impressing upon the diseased tissues a franker and more healthy life, and thus restoring them to their normal nutrition and secretions. The remarkable point in these remedies, whether general or local, is that each diathesis and each morbid product has in the materia medica some special alterative, which may be called specific, if we choose, provided that we do not seek, in the occult and cabalistic action which this expression still represents, a pretext for empiricism and for a treatment which dispenses with the need of being a physician.

Following our analogy, we see that each species of cryptogamic morbid product in animals has its special topical remedy, which usually succeeds better than others.

It is long ago that our master, Bretonneau, proved, for example, that caustics were like the phlegmasiæ in possessing specific characters; and that the burns caused by each could be distinguished by their forms, course, duration, the character of the pain, the manner of cicatrization, etc.

The incontestable truth of pathological specificity necessarily implies that of therapeutical specificity; and alterative treatment proves this, both by the agents which it employs and by the diseases to which they are applied.

In conclusion, we would offer a remark, intended to meet certain well-founded objections to the classification we have adopted.

The remedies which we have studied in this chapter are not exclusively alteratives. We do not know that there exists in medicine a remedy which can be strictly ranged in one class. Opium has with justice been placed in the class of narcotics; but, on the other hand, opium is a powerful excitant of the circulation, a sudorific, aphrodisiac, and emmenagogue, as gold is a powerful tonic to the stomach. Cod-liver oil, by its complex composition, offers as much difficulty in classification. The chemical principles it contains (iodine, bromine, etc.) give it a place with these alteratives, while its most marked remedial powers would seem to place it

with analeptic tonics. We would indicate two things: first, the difficulty, not to say the vanity, of classification; and further, the necessity of attending to the complex qualities of drugs, and of bearing in mind that they are two-edged weapons, and that it is our duty to be able upon occasion to use one of the qualities and neutralize another which under given circumstances might be injurious.

CHAPTER IV.

IRRITANTS.

Potassa.

Caustic potassa is usually employed to open issues. Potassa cum calce is preferable to pure potassa, because it spreads less. Of late years the Vienna caustic has been preferred; it is much superior to potassa with alcohol. The substance is applied by placing on the skin a piece of diachylon plaster with a hole as large as the potassa. The latter is placed at the hole, and is kept there by another bit of diachylon, larger than the first, and compresses and bands over that.

A burning sensation is felt at the end of a few minutes, and then an intense burning which lasts three or four hours, after which everything becomes quiet. On raising the apparatus at this time, a gray spot is seen, a little soft at its centre, and coriaceous at its circumference. This spot usually occupies the whole thickness of the derma, and is four or five times as broad as the diameter of the piece of potassa. This circumstance must not be forgotten in selecting the potassa.

The eschar, at first soft and moist, soon dries and takes a darker tint. If a piece of diachylon, or any other substance capable of retaining moisture, is constantly applied to the skin, the eschar remains soft until it falls.

The destroyed portion of derma falls at an indeterminate period; if it was not adherent to the tissue beneath, it usually falls in from six to ten days; but if the skin is thick, it may not be detached for two months. The separation from the quick commences at the circumference.

The size of the eschar and the slowness of the separation always cause an objection to the use of caustic potassa, and, in general, of the potential cauteries, for making issues. The lancet and bistoury are certainly preferable if the patients are not timid.

The Vienna powder is prepared for use by adding alcohol or eau de cologne, and making a firm paste, which is extremely caustic, and has the advantage of not spreading. M. Hennau (*Revue médicale*, 1833, t. I., p. 212) used it to establish issues. He required from six to ten minutes to form the eschar. We had often repeated his process for establishing issues, when it occurred to us to employ it in the treatment of superficial cancerous tumors, especially of the breast, upon which subject we published a paper in the *Journal des connaissances médico-chirurgicales*

(décembre, 1835). A caustic paste used in the same case, composed of lime, potassa and opium, has been described in the "Pharmacopée universelle" of Jourdan, t. II., p. 317.

Since the publication of our paper, M. Bonnet, of Lyons, employed caustic potassa to cauterize the skin and the walls of veins for the purpose of obliterating the chief trunk of a superficial group of veins on the leg, in the case of severe varix or varicose ulcer; but Aug. Bérard justly prefers the Vienna caustic to potassa for this purpose. He has, by our advice, attacked nævi materni with the same caustic, and his results lead him to place this treatment above all others, at least in most cases.

Several surgeons have been struck with the bad effect of the too frequent application of caustics in uterine affections, an effect which led Amussat, following Dupuytren's example, to use caustic potassa, which is powerful enough to convert all the altered tissues rapidly into an eschar, so that only a few applications are needed in order to give a complete cure. But, on the other hand, potassa itself has inconveniences: it melts very quickly, and may flow behind the speculum down the posterior surface of the vagina, producing eschars which in some cases have perforated the recto-vaginal septum. This mishap cannot be avoided without the most minute care. The following preparation has been made by M. Filhos, at the suggestion of Amussat:

℞. Potassa..... 200 grammes.
Quicklime..... 100 "

These are put into a large iron ladle and exposed to a very quick fire. The potassa soon melts, and the lime a little later. When both are completely liquefied they are very thoroughly mingled and cast in cylinders, the mould having first been warmed; the sticks are not to be taken out until perfectly cool. The melted caustic is usually poured into leaden tubes with thick walls, closed at the ends, and kept in glass tubes containing quicklime and hermetically stoppered. The cylinders are excessively hard. They quickly absorb the moisture of the air, becoming covered with a mixture of hydrate of lime and potassa. To preserve them for an indefinite time they may be covered with a lamina of lead, or, still better, with a thin layer of sealing-wax, as directed by M. Dumeril for stick-nitrate of silver; they are afterwards enclosed in glass tubes, which are carefully stoppered.

This caustic adds to the advantages of potassa, that of not melting so quickly when used. M. Filhos directs the following method of application. The patient is placed on the edge of a high bedstead, her legs supported on chairs, and her back so high that the vagina takes an oblique position, pointing downwards and forwards, so that the liquids which flow from the cervix uteri may pass directly into the speculum, instead of going between the instrument and the vaginal canal. The full speculum is to be preferred. It is to be oiled and introduced carefully,

and the cervix well exposed. The affected part is then sponged with the greatest care, and a small dossil of charpie or cotton attached to a long thread is introduced in front of the anterior extremity of the lower valve of the speculum, immediately below the neck of the uterus; this is to protect the part of the vagina below the point to be cauterized. With a little practice the latter operation may usually be dispensed with; it prolongs the operation somewhat. The cylinder is next applied, held in a porte-caustique or fixed in the end of the glass tube which contains it. After the cauterization the eschar is quickly wiped with balls of charpie grasped with the forceps, which is placed at one end of the porte-caustique. The dossil of charpie is then promptly removed and two injections of cold water are made, or better, of water slightly acidulated with vinegar; the injection must be made to reach the neck of the uterus. The acidulated water neutralizes the small amount of caustic which may adhere to the eschar. After the injection a small piece of bandage must be placed in the vagina, with the lower extremity projecting between the labia majora, for the purpose of withdrawing it. The patient is then replaced in her bed.

The caustic stick must be exposed only at one end. If the exposed end is covered with a slight crust of subcarbonate of lime from previous use, it must be removed with a file. The action may be made more vigorous by dipping the caustic lightly in alcohol, brandy, or cologne water. After cauterizing, the cylinder must be wiped with care before it is replaced in the glass tube.

M. Levrat-Perotton has recommended caustic potassa for ingrowing nail, to check the fungous growth ("Transact. méd.," t. XI., p. 41). M. Solera uses it as a cylinder, covered with shellac varnish, in treating lachrymal fistula, pterygium, trichiasis, unhealthy ulcers, ranula, contractions of the rectum, ulcerations of the neck of the womb; and to perforate the membrana tympani (*Bulletin des sciences méd.* de Férussac, t. XX., p. 336). Without sharing M. Solera's exclusive admiration of this caustic, we gladly admit that, when used in his way and with the little precautions which he advises, it renders very great service in surgery.

Gimbernat used it in a collyrium, in the dose of 5 or 10 centigrammes to 30 grammes of distilled water (gr. 0·8—1·6 and ℥ i.) to remove maculæ of the cornea. Saviart and Cohen dissolved it with camphor or alcohol in water, to stimulate indolent ulcers.

The properties of subcarbonate of potassium are precisely those of potassa, except that externally it can only be used locally and not as a caustic. But, in all cases where potassa is used otherwise than as a scarifier, it is much better to use the subcarbonate. Baths, lotions, vaginal injections, and pomades, must be made with the subcarbonate, and not with pure potassa. These local applications are of especial use, as we have said, in affections accompanied by pruritus.

The specific for tinea, of the brothers Mahon, is only a mixture of alkaline substances derived from the ashes of green wood.

For gouty patients with very marked uric diathesis, Dr. Galtier Boissière prefers the alkalines to weak organic acids, tartrates, citrates, malates of potassium especially, and also of sodium and magnesium, to all other alkaline carbonates, and even to the alkaline mineral waters.

He uses with benefit the following mixture, usually in the interval of attacks, but also at the beginning or end:

Tartrate of postassium	50 grammes	(ʒ xiiss.).
" " sodium.....	30 "	(ʒ viiss.).
" " magnesium.....	20 "	(ʒ v.).

Mix, pulverize, and divide into ten papers, each containing 10 grammes (ʒ iiss.).

As an alkaline drink, take daily half or the whole of a paper in a large cup of ptisan of inula, orange, or ash.—As a purgative, take every week, fortnight, or month, three or four papers in as many cups of the same ptisan.

For external use in gout, M. Galtier Bossière much prefers potassa to soda and the other alkalines. In gouty affections of the limbs, when there are no acute pains left, he has often used general or local baths, in which he places from 30 to 60 grammes (say ℥ i.—ii.) of caustic potassa for a full bath of 300 litres (quarts). He uses a solution of 2 or 3 grammes (gr. 30—45) to a quart of water to make fomentations in tophus.

Soda.

This substance was long confounded with potassa; and, in truth, the chemical and physical properties of the two are almost identical. Its therapeutic properties are almost alike. There is, however, one important distinction to make.

In external use there is little difference; whether soda be used with alcohol or lime to open issues, or whether subcarbonate of sodium be used in solution for local or general baths, vaginal injections in pruritus of the vulva, etc.

The neutral carbonate, also called subcarbonate, is used externally as an alkaline and irritant. We use it daily in soap. This is a substance of remarkable properties. It first frees the skin of its sebaceous coat, and softens the superficial layers of epidermis, which are carried away by the water, and thus rids the skin of many foreign substances which are insoluble, or slightly soluble in water. The epidermis, scraped off, leaves the skin sensitive to the action of the alkaline, and an increase of peripheral circulation follows, with a certain increase in the heat of the skin, which often lasts several hours after the bath.

The bath of carbonate of sodium, by producing this peripheral fluxion, has a valuable derivative action, which is of singular use in aiding the action of alkalines taken internally. This effect is often sufficient to ar-

rest certain visceral fluxions. We will point out by the way that the constipation of young children, which is so hard to treat with internal remedies, yields almost immediately to the alkaline bath. For this purpose we do not dissolve the salt in the bath, but soap the child's body all over before the bath, either with common soap, or better, with black soap, which is made with potassa.

Silicate of Sodium.

Blennorrhagia.—M. Gontier, interne of M. Marc Sée, at the Hôpital du Midi, has treated seventeen patients, almost all in the acute stage of blennorrhagia, and the majority having orchitis, with three daily injections, containing on the average 2 per cent. of silicate of sodium. All that can be said is that the injection was usually well borne. The reports are not such as to lead to a substitution of this for ordinary astringent injections; it is much more expensive, and perhaps is not always of uniform composition. The same may be said of the treatment of non-infecting chancres.

Cystitis.—Dr. Dubreuil, surgeon to the hospital of Lourcine, has employed the same solution in cystitis with purulent and ammoniacal urine, and has had some success (Société de chirurgie, 13 novembre, 1872). MM. Gosselin, Marc Sée and Champouillon have obtained analogous results; but it is hard to say how much is due to silicate of sodium, for the washing out of the bladder, and the care taken to empty it completely, are almost sufficient to cure the disease without medicine.

Others have sought to prove that there is a category of mineral waters which owe their action solely to the amount of silicate present. Dr. Hugues, physician to the silicated waters at Sail-lès-Château-Morand (Loire), who had proposed this theory, claims that the silicates are the only active principles of the waters of Plombières, of Evaux, of Arlanc and Sail, which contain from 0·13 to 0·25 grammes per litre (quart). This hypothesis is far from being justified; all that can be said is that the waters of Sail accelerate the cure of ulcers, whether atonic, varicose or scrofulous. The attempt to make these waters a substitute for those of Vichy is quite unjustified.

Lime.

Lime is less caustic than potassa and soda. It is rarely employed alone as a caustic. United with medical soap in equal proportions, it was formerly used to destroy warts and fungous growths, to modify the surface of certain carcinomatous sores, and to destroy some superficial tumors (*Ancien Journal de médecine*, t. LXXX., p. 309). The Vienna caustic is a very energetic powder composed of 6 parts of quick-lime and 5 of potassa; and the pâte d'Else, composed of opium, potassa and lime,

may also be of much use in surgery. M. Jobert has used Vienna caustic with success in wens, by painting it on.

An English physician, Dr. Osborne, has proposed in the *Dublin Journal* a new method of cauterization, to take the place of the ordinary moxa. He uses for this purpose quick-lime. A piece about 12 millimetres (0·47 inch) thick, as fresh as possible (this condition is indispensable to success), is placed in a porte-moxa, or on a card pierced at its centre with a round hole, and the instrument is applied to the skin at the point to be burnt. A few drops of water are then let fall on the lime, which immediately swells and crumbles, giving rise to a heat of about 187·5° centigrade (369·5° F.). The lime must be withdrawn before all the heat of which it is capable is disengaged; otherwise the derma would doubtless be destroyed in its whole thickness. It is of course easy to get an eschar more or less deep, according to the length of time the lime is left in contact with the skin.

Osborne thinks that this moxa is preferable in some cases to all others. It gives instantly a very intense heat, with the advantage of producing an action at once rapid and deep, without terrifying the patient with the sight of fire and the sparks which burning bodies almost always give out.

This alkali forms the basis of most epilatory pomades, including that used by the brothers Mahon to get rid of the hair in tinea, which is at the same time curative of the disease; also of the epilatory powders, in combination with orpiment, a mixture which is not free from danger, and may even cause terrible accidents if used to remove hair from ulcerated surfaces.

Tinea.—Böttger, a distinguished chemist of Frankfort-on-the-Main, was the first to remark the very energetic depilatory power of sulphohydrate of sulphuret of calcium. This substance is obtained by causing sulphuretted hydrogen gas to be absorbed to saturation by a pulp composed of two parts of slaked lime or dry hydrate, and three parts of water. It forms a greenish-white jelly.

It is used by spreading a layer of about two millimetres in thickness (0·08 in.) upon the part from which the hair is to be removed. After two or three minutes, it is removed with an ivory knife or a cloth, and the skin is found entirely freed from the hairs, without any excoriation or injury of the epidermis, and without any sensation except a certain stinging.

While recommending the trial of this new remedy, we must warn physicians that it sometimes attacks the skin slightly, and often produces redness and pain; but these are usually too slight to contraindicate the remedy.

Burns.—The liniment formed of a soap made of one, two or three parts of lime-water and four parts of oil of sweet almonds, is especially recommended by Velpeau in the treatment of burns; it has been of real service in burns of the three first degrees; that is, up to the degree of

severity which causes the mortification of the skin to a certain depth, with suppuration and a cicatrix.

When there is simple redness or blistering, the use of the liniment often causes very rapid resolution.

An old woman received a burn in the third degree upon the front of the chest. The suppuration increased her debility in an alarming way, until the application of the liniment caused desiccation, and the strength was restored with a rapidity which was unexpected in so impoverished a frame (*Bull. de thér.*, t. XIV., févr., 1838).

Diseases of the skin.—This liniment is also used with great benefit for the cruel itching which accompanies some dartrous affections.

Lime-water is used externally for the same purposes as the weak solutions of subcarbonates of sodium and potassium. It certainly has great power to heal old atonic ulcers, and to calm itching of the skin and of the genitals; as a gargle it is useful when the gums are soft or fungous, and the mucous membrane of the velum and the tonsils is the seat of old and sluggish inflammation.

Diphtheria.—Numerous experiments show that lime-water possesses a power of dissolving croupous false membranes, which is superior to that of the solution of potassa (one of the best solvents), but inferior to that of lactic acid.

Vapor-baths.—Caustic lime of commerce is used for vapor-baths, as follows: a piece weighing 1 or 2 kilogrammes (2—4 lbs.) is wrapped in a coarse cloth well moistened, and placed in the bed of the patient, the coverings having been first raised and supported on hoops. When the water begins to be absorbed by the lime, the temperature rises, it is converted into vapor, and if fresh water be added from time to time, very warm and abundant vapors soon arise, forming a genuine vapor-bath. By restricting the application to a part, a local vapor-bath is given.

By this simple and inexpensive method we have dispelled in a few days various rheumatic pains, especially lumbago and sciatica, which had resisted other treatment. It is, however, important that the patient should understand the action, so as to withdraw the lime when the heat becomes too intense, lest he be burnt. For further precaution, the lime should be wrapped in a thick cloth, doubled several times, and not too closely. A decoction of marshmallow or elder may be substituted for the water, if desirable.

Ammonia.

Effects of External Application.

When applied to the skin, concentrated ammonia rapidly produces a sensation of burning, followed by redness, vesication, and at last a superficial eschar. This precious property has been of great use; we daily employ it in preference to hot water, burning alcohol, and other means,

by Lavagna and Ashwell, and says that they have been followed by very remarkable results in the case of young virgins in whom the menses appeared slowly. He puts 10 or 12 drops in 30—45 grammes (℥ i.—iss.) of warm milk, and increases the dose by 5 drops a day until the irritant effect is hard to bear; in persons who are not irritable, 50 or 60 drops may be used. The injection is taken on going to bed, in such a position that the liquid is retained at least 10 minutes; they are repeated several days in succession, and sometimes twice a day.

But though ammonia, used topically, has restored the menstrual flow, La Pira regards it, when diluted with four parts of water, as a hæmostatic; and Girard, of Lyons, prescribes it in the dose of 4 grammes (ʒ i.) to the litre of water (Oii.) as an injection in ulcerated cancer of the cervix, to destroy the odor, relieve the pain, and lessen the hæmorrhage.

Ammonia diluted with water forms a useful application in gout. M. Hutin, physician to the Hôtel des Invalides, used to have applied, to feet affected with acute articular gout, compresses dipped in the following solution:

Aqua ammoniæ.....	4 grm.	(ʒ i.).
Water.....	150 "	(℥ v.).

This is very soothing, and is quite in general use.

Ammonia forms a part of some celebrated cosmetics for stimulating the growth of the hair.

Aqua ammoniæ	3·54 gram.	[gr. 54·6].
Essence of bitter almonds.....	3·54 "	[idem.]
Spirit of rosemary.....	28·33 "	[gr. 436].
Essence of mace.....	0·88 "	[gr. 13].
Rose-water.....	75·00 "	[gr. 1,157].

Mix first the essence of bitter almonds and the ammonia; then, after adding the essence of mace and rosemary, stir them together; add last, by degrees, the rose-water.

The external use of ammonia has been praised by some, including M. Ducros of Sixt, who place a brush filled with liquid ammonia on the mucous membrane of the pharynx in treating nervous asthma, capillary catarrh, whooping-cough and spasmodic hiccup. In some susceptible patients, the immediate inhalation of the gas which occurs at the instant of application causes a spasm of the glottis, so that respiration may be suspended for some seconds, and life seems in danger. This cauterization should be made at first with a very weak solution, and afterwards with concentrated ammonia. Some obtain the same results by cauterizing the vault of the palate.

In our opinion, the latter procedure ought to be generally adopted, because it gives exactly the same result without the same dangers.

In performing the cauterization we use a brush, which is first wet

with concentrated ammonia, and afterwards dipped lightly in water. Having ascertained by smelling that the vapor is not in excess, it is carried to the velum or arch of the palate, on which it is very rapidly painted. Three or four seconds suffice.

After a moment of anxiety and a fit of coughing followed by the expectoration of mucus streaked with blood, the patient recovers, and usually says that he is considerably better; the dyspnœa has disappeared, or, if there were any, the attacks of suffocation. In most cases, no doubt, the remission is only temporary, but it is nevertheless true that in some cases the attack of asthma is cut short; and some physicians claim to have obtained complete cures.

The simplest plan, and the one which we use most commonly, consists in keeping in the room a vessel of water containing some ammonia; this seems to be often of service in nervous asthma.

Syncope.—Ammonia, or rather its vapor, is used daily in cases of syncope, or when, after any cerebral trouble, the consciousness is long in returning. We need not speak of the great objections to the long continued inhalation of ammonia. It is proper to stimulate the mucous membrane of the nose and larynx by this remedy, but the observations of Majault ("Réflexions sur quelques préparations chimiques," etc.; Paris, 1779), those of Fourcroy ("Encycl. méth."), and of Percy (*Bull. de la Faculté de Paris*, 1815, p. 517), prove that so energetic and dangerous a remedy should not be entrusted to unskilled or careless hands, as is constantly done.

Sage, an observer worthy of some confidence, has quickly restored animals to life after asphyxia by carbonic acid, by making ammoniacal vapor penetrate the bronchi and nasal fossæ. Was recovery due to the fact that the nerves were simply stimulated, or that the carbonic acid contained in the air-passages was neutralized?

To obtain a less rude effect, the English have bottles containing muriate of ammonium and carbonate of potassium. The mutual action of these two salts is slow and disengages a small quantity of ammonia-gas.

Venomous poisons.—The popularity of ammonia for the treatment of the bites of venomous animals is founded on the celebrated case of Bernard de Jussieu, which has been so ill observed and interpreted. Fontana, the most logical of toxicologists, and the most ingenious and skilful of experimenters, has in vain proved the puerility of Jussieu's observation ("Exp. sur le venin de la vipère"); in vain has he proved a thousand times that the bite of the viper and the stings of most poisonous insects rarely cause death; it is still believed that eau de luce and ammonia prevent the death of the few persons who take them. We have never seen the symptoms of poisoning by the bite of venomous brutes in any respect modified by the outward or inward use of hartshorn: and, far from sharing the opinion of Manglini ("Sul veneno della vipera," 1809), of Sonnini (*Journal de Physique*, 1776, t. VIII., p. 474), and of Sage,

we adhere to that of Fontana and Gaspard (*Journ. de phys. de Magendie*, t. I., p. 248), namely: that ammonia and its combinations, such as eau de luce, are at least useless, and even harmful when they give a false security and prevent the use of more efficient means.

Compounds of Ammonia.

The principal compounds used in medicine are the carbonate, the acetate and the muriate of ammonium.

Carbonate of Ammonium.

This salt, a strong alkali, owes its therapeutic virtues to ammonia only. The dose is twice as large.

In England, this salt is used in cases of syncope and epilepsy, the patient being made to inhale it, with precautions; it is kept in a wide-mouthed bottle with ground stopper, and the salt is flavored with various aromatics.

Applied externally, carbonate of ammonium, like ammonia, may produce rapidly all degrees of irritation, from rubefaction to cauterization. Chaussier preferred it to Gondret's pomade, which loses its virtues in few days (Mérat and De Lens: "Dict. de mat. méd.," t. I., p. 245).

Carbonate of ammonium is an ingredient in an American hair-wash:

Tincture of the leaves of myrcia acris..	140 grammes	(2100 gr.).
Essence of laurel.....	1.77 "	(27.2 gr.).
Bicarb. ammonium.....	28.00 "	(432 gr.).
Borax.....	28.00 "	
Rose water.....	1.13 litres (quarts).	

Mix and filter.

Acetate of Ammonium.

What we have said of the carbonate may be said of the acetate. We ought, however, to mention what Boerhaave, Cullen, Selle and many others have said of the spirit of Mindererus; all of whom, and our own contemporaries also, ascribe to the acetate a power of rendering the circulation, the secretions, etc., more active—a power which it shares with the volatile alkali (Cullen: "Mat. méd.," t. II., p. 366; Selle: "Obs. de méd.," p. 70). As to its effect in intoxication (Mazuyer: *Gazette de santé*, nov., 1826), upon migraine (*Ibid.*), and on the uterine pains which accompany the monthly flow, it seems entirely like that which we have already ascribed to ammonia. But the acetate has lately been used in quite a special way as a sedative of the uterine action. M. Patin has reported several observations showing that if given in cases of excessive or too frequent menstruation, or even in cases of hæmorrhage from uterine cancer,

it lessens the amount or the frequency of the flow. In this case we give 15 grammes in the 24 hours, in four doses. The same authority has often found acetate of ammonia useful in cases of difficult and painful menstruation, causing the pain to cease and thus assisting the flow. From 50 to 72 drops may be given, divided into two doses and mixed with a glass of sweetened water. The first dose is to be taken as soon as the pains and malaises of the monthly period are felt; the second, if necessary, is taken half an hour later, and may be increased according to the severity of the symptoms.

He reports a case of nymphomania treated with great success by this remedy. Then he draws certain analogical inductions, to wit: that acetate of ammonia might be of much use to women who are inclined to abortion by the flow of blood towards the uterus which occurs in inflammations of the womb and the ovaries, and in organic lesions of those parts (*Arch. gén. de méd.*, t. XVIII., p. 217).

Muriate of Ammonium.

In the chapter on alteratives we mentioned the internal administration of this salt for the relief of catarrhal affections. We now study it from a very different point of view. In 1837, Fuchs of Göttingen attempted to apply it directly to the mucous surfaces. In 1838 and '39, he published an account of his success in treating chronic bronchitis by the inspiration of the vapor of muriate of ammonium, produced by throwing the salt upon heated plates. The treatment was introduced in France by Professor Lasègue, and then abandoned. Löwin of Berlin, thinking that this abandonment was due to a rude method, devised an apparatus for disengaging the substance in a nascent condition; the patient inspires at will, and in amounts which can be regulated, and is not suffocated by the vapor, as in Fuchs' procedure.

Löwin's inhaler is composed of three bottles of unequal size, the largest holding 120 grammes of distilled water, while the two smaller, containing each 60 grammes, are filled with muriatic acid and caustic ammonia respectively.

Libermann, physician to the military hospital of Gros-Caillou, brought this apparatus to our notice, and has used it since 1868. His conclusions are as follows:

The patient who uses the apparatus must begin by breathing moderately. He feels the vapor traversing his larynx, and giving rise to a sharp prickling. The first effect is a lively irritation of the mucous membrane, which increases the catarrhal secretions, but easily subsides by degrees. A part of the salt is absorbed and passes off by the urine. The circulation is accelerated; there is a feeling of heat, and even a little sweating and diuresis. The cough and the hyperæsthesia of the respiratory mucous membrane are quieted.

As a result of the treatment, the chronic granular angina which succeeds the inflammatory affection usually disappears quite soon. In herpetic angina, the inhalation gives a little relief, but does not cure. In chronic bronchitis it lessens the amount of the secretion and quickly dries it, but the stimulant nature of its first effects prohibit its use in acute tuberculous bronchitis. It has some efficacy in convulsive coughs and the various forms of idiopathic asthma (*Bulletin de thérapeutique*, 30 octobre, 1873).

Ruete of Göttingen considers sal ammoniac a powerful preventive of suppression of the perspiration of the feet, saying that in his experience it has proved infallible. In cases of suppression, particularly in gouty or rheumatic patients, who do not usually bear foot-baths well, and yet need to have perspiration re-established, he has always obtained the best results within a few days. He powders a stocking with a small spoonful of sal ammoniac and twice as much quick-lime; the patient puts on this stocking before going to bed, and wears it all night. In the lightest cases it suffices to repeat the procedure a few times; in obstinate cases the stocking must be freshly charged in the morning, to be worn all day.

In this mixture the acid of the salt combines with the lime, and the liberated ammonia must be considered the most active principle. An agreeable warmth is felt in the feet; a slight prickling, itching, and in a short time an abundant sweat ("Encycl. des sc. médic.: extrait des journaux allemands," 3e cahier, juillet, 1839).

Chlorine.

Infectious diseases.—The power which chlorine has of decomposing almost all organic products, and depriving them of smell, has led some physicians to think that it would neutralize morbific miasms and check epidemics. There is no kind of absurd falsehood and apocryphal or ill-observed fact that has not been published upon this subject; but we have very recent and sad experience of the uselessness of the remedy. At the beginning of the yellow fever which devastated Gibraltar in 1828, chloride of lime was thrown into all the sewers of the town and into the gutters, was placed in all the barracks, and given away to all the inhabitants. Terror made every one observe this regulation faithfully; and yet, three months later, there were scarcely 500 inhabitants that had not paid tribute to the epidemic. When the cholera invaded Paris and France, we know what vainly prodigal use was made of the disinfectant chlorides. As regards epidemics, chlorine and the chlorides are probably useless. We cannot deny their disinfecting power; but there are many persons to whom their odor is less tolerable than that of the smell they replace.

If chlorine and the chlorides used as disinfectants are useless in preventing epidemics, may they not have more valuable properties when ap-

plied topically, and when chlorine is brought directly in contact with organic matter charged with the virus? Experience alone could prove this, and facts must have great value.

It is said by most faithful observers that the plague is transmitted by the garments of those who have had the disease. Experiments made by the medical commission sent to Egypt in 1829 showed that such clothes, washed in water, macerated in a weak solution of chlorinated soda, and dried in the sun, may be worn next the skin with impunity. A little reflection will show how inconclusive such experiments are, and how ill-founded the conclusions which are claimed; for it is certain that a good washing in simple water renders the garments of plague-patients harmless.

Hydrophobia.—Chlorine and the chlorides are said to be capable of destroying the poison of rabies. Brugnatelli, in 1816, was the first to celebrate these properties with enthusiasm. He washed the fresh wounds with liquid chlorine, and gave it internally, in the dose of 1¼ grammes for children (gr. 19) and 8 grammes for adults (ʒ ii.), four or five times a day during several weeks (*Journ. gén. de méd.*, t. LIX., p. 303). Other Italian physicians subsequently confirmed these statements (Arragoni: *Bull. de la soc. méd. d'émul.*, févr., 1823, p. 127). In France, M. Chevallier used it successfully for a student in pharmacy who had been bitten by a mad dog. Schönberg and Semmola (*Bulletin des sciences médicales* de Férussac, mai, 1828) testify to the same. Semmola claims to have cured nineteen persons who were bitten by dogs that were certainly hydrophobic. He washed the bites with chlorine diluted with water, and dressed them twice a day with a pledget of charpie soaked in the same. At the same time he gave chlorine for forty or fifty days, from 8 to 30 grammes (ʒ ii—viii.) three times a day, diluted with a proper amount of sweetened water. He gives a story which he thinks demonstrative. Three persons had been bitten; two underwent the treatment and had no symptoms, but the third refused, and died with hydrophobia twenty-three days after the bite. There is one grave objection to Schönberg's and Semmola's statements: "Are you sure," we might ask them, "that your careful cleansing of the bites was not a chief cause of the favorable result—and would not washing with pure water have had the same effect?"

In response to such objections M. Costa took a dog which presented all the symptoms of confirmed hydrophobia, and inoculated two well dogs with the saliva in five or six places, besides causing the other to bite them in several spots. Six hours later, the wounds of one dog were carefully washed in a solution of chloride of sodium in one-half its bulk of water, which was also injected to the bottom of the wounds. The other dog was washed with equal care, but in pure water. The results in the two cases were very different. The dog which had been treated with chlorine presented no sign of the disease, but the other died in thirty-seven days with all the symptoms of rabies (*Journal des progrès*, t. XIII., p. 233).

The fact reported, conclusive as it seems, proves nothing, except that lotions and injections made with an irritant substance such as solution of chlorine and the alkaline chlorides, may modify the virus in the wound and prevent hydrophobia.

Such a conclusion would not seem justified if it were not for large numbers of facts, which have been collected by Trolliet "Recherches sur la rage," and Stanislas Gilibert ("Compte rendu de la société de médecine de Lyon depuis 1812"), and which unhappily disprove the great promises of Brugnatelli and those who held his views. It would certainly be culpable to neglect certain and heroic means in favor of a treatment which may have been successful, but which is so much in dispute.

Variolæ.—With more reason and success, Gubian of Lyons washes the surface of the body in confluent variolæ with chlorinated water, at the period when the pus begins to be fetid (*Journal de chimie méd.*, t. VI., p. 316); Boyer of Marseilles injects it into the cavities of large abscesses which keep up a resorptive fever (*Gaz. méd.*, 1834, p. 196); that Récamier ("Leçons orales de clinique"); Deslandes ("Nouv. biblioth méd.," t. VIII., p. 151) pass chlorinated injections into the uterus when the placenta or any mass is putrefying in the cavity of the organ. For the same purpose, Reid of Dublin gives injections and washes of chlorinated lime or soda to change the odor of the dysenteric stools and lessen the inflammatory irritation of the mucous membrane of the large intestine. Cottereau and Chevallier also recommend, in order to destroy the smell of pus in ozæna, and to cleanse ulcers of the pituitary membrane, the inhalation of chlorinated powders or liquids.

Hydrochloric Acid.

Ulcers.—Liquid hydrochloric acid, the only form which is now used in medicine, is one of the most common caustics; the eschar which it causes is superficial, and the sore which follows the fall of the eschar cleans rapidly. Internally it is an irritant and powerful poison.

This acid was lauded by Boerhaave, Van Swieten, Marteau, Granvilliers, but was hardly used in our time until Bretonneau of Tours called attention anew to its useful properties, employing it in pseudo-membranous diseases of the mucous membranes to produce superficial cauterization (see "Traité de la diphtérite"). He directs that the acid shall be fuming. He observes that this acid, like most mineral acids, coagulates the albumin which enters into the secreted mucus, and which also produces a pellicular inflammation which must by no means be confounded with that of which we desire to prevent the formation, the reproduction, or the extension. An error of this sort led M. Baup to say that hydrochloric acid propagates diphtheritic inflammation. The same acid is used topically by the illustrious practitioner of Tours to combat certain chronic scaly diseases of the skin.

Some years ago Ricord made at the Hôpital des Vénériens a successful application of concentrated muriatic acid to the treatment of mercurial ptyalism. He had remarked, as many others had done, that the salivation did not depend, as was said, upon a direct irritation of the salivary glands by mercury, but upon the inflammation of the gums, which, whether mercurial or not, always gave rise to salivation. He considered that the treatment ought to be directed entirely towards the preventing the mercurial inflammation of the gums. As soon as he sees the gums of the lower incisors begin to swell, he cauterizes them straightway with fuming muriatic acid, and repeats the operation once every day until the inflammation is dissipated. He performs the operation with a little brush, which he passes lightly over the gums, taking care to avoid the teeth.

In sanious ulcers of the tonsils, the gums, the cheeks, in aphthæ, or muguet, muriatic acid, pure or mixed with half its weight of honey of roses, rapidly cleanses the mucous membrane. It has been used with equal success in hospital gangrene, a disease accompanied by diphtheritic and pultaceous exudations quite analogous to those which are developed on the mouth and tonsils (see for quotations, Gmelin: "Apparatus med.," pars II., vol. i., p. 53).

Some physicians have recommended for chilblains lotions made with a mixture of muriatic acid and water (Linné, quoted by Gmelin, loco supra dicto; *Journ. de Vandermonde*, t. VII., p. 154). This means has seemed to us quite efficacious in general. Rowley reported the cure of erratic gout by placing the feet in a bath acidulated with hydrochloric acid ("Treatise of the regular, etc., gout," London, 1792). Plueck professes to have cured an obstinate tinea with a pomade composed of one part of muriatic acid, one of ointment of althea, and four of juniper ointment (Vide Gmelin, p. 55, l. c.)

Internally, muriatic acid has been recommended as an antiseptic, under the same circumstances as chlorine; or as a temperant, under the same conditions as other acids (see t. II., "Médicaments sédatifs").

The acid was used as a disinfectant long before chlorine; Guyton, of Morveau, in 1773 first used it by fumigation to disinfect the tombs of Dijon and the dungeons of the city prison, where the mortality was great.

Mode of administration and doses.—The acid may be used concentrated; it is commonly mixed with honey or water, in proportions so variable that it is impossible to indicate them here. For foot-baths, from 125 to 250 grammes (℥ iv.—viii.) are usually put into 6 or 8 quarts of hot water.

Alkaline Chlorides.

Javelle's water has long been used in the arts for bleaching; it was generally known in 1789. Percy is said (*Revue médicale*, 1826), but on very questionable authority, to have used it in the army of the Rhine, in 1793, for hospital gangrene.

Chloride of lime was named by Guyton de Morveau, in 1801, as a disinfectant (l. c.), and in 1803 by Alyon (*Annal. de chimie*, t. LIII.), as a preventive of contagion.

But the first authenticated use of chlorides plainly belongs to Masuyer, of Strasburg. In his "Observations sur la maladie dite fièvre des hôpitaux," published in 1811, he describes the property possessed by chloride of lime, of slowly disengaging chlorine; by means of which he disinfected the air of hospital wards. The writings of Gimbernat, Bories, and Pâtissier followed; and Labarraque subsequently described most distinctly the disinfecting powers of the various alkaline chlorides.

Labarraque did not actually demonstrate the disinfecting powers of the chlorides, but by his enthusiasm (perhaps exaggerated) he compelled physicians to use them in all kinds of internal and external diseases. In the years 1825, '26 and '27, they threatened to carry by storm the whole of surgical therapeutics, whose walls had been breached by the school of the Val-de-Grâce; but by degrees the fashion passed by, and the chlorides fell into their proper place.

We have no more to say of the chlorides as disinfectants, but will confine ourselves to properties which are not solely due to chlorine.

The chlorides, in virtue of their great alkalinity, have been used externally, and have properties like those of solutions of carbonate of sodium and potassium, and lime-water. This is probably the explanation of their numerous applications in surgery.

In urethral blennorrhagia, and more especially in that of the vagina; and in leucorrhœa caused by inflammation of the neck of the uterus or a chronic inflammation of the vaginal mucous membrane, injections of chloride of lime, sodium or potassium are useful for the same reason as alkaline solutions (Daumas: "Thèses de la Faculté de Paris," 1825, No. 120; Blache et Jolly: "Dict. de méd.," 2e éd., t. VII., p. 431).

In pruritus of the vulva (Darling: *Med. Repository*, Feb., 1826), in superficial herpetic affections (Alibert: "Nouv. élém. de thér.," t. II., p. 453), in itch (Derheims, Fontanetti: "Hospital Transact. Med.," t. X., p. 385; *Journ. des conn. méd.*, t. I., p. 233), in some diseases of the scalp (Chevalier: "Art de préparer les chlorures;" Roche, Cottereau: *Ibid.*); the alkaline chlorides possess neither more nor less virtue than the solutions of lime, potassa, or soda, which are generally successful in such circumstances.

It is probably due to the same property and mode of action that the chlorides act favorably, not only on blennorrhagic opththalmia and urethral blennorrhagia, but also on scrofulous, and even epidemic, ophthalmia (Varlez: "Dict. de Mérat et de Lens," t. II., p. 359; Guthrie: *London Med. and Phys. Journal*, Nov., 1827; Hesberg: *Gaz. méd. de Paris*, 1831, p. 183).

In the above affections, the chlorides probably owe their value to their alkalinity. Whether this is true also in the diseases we are now about to mention, is a matter for observation to decide.

Lisfranc, one of the strongest partisans of the chlorides, who has used

them with great benefit for chronic ulcers, attributed to them a special efficacy in the case of burns; saying, with Dupuytren, that no treatment was more effective in burns of the second or third degree; but the experience of others by no means confirmed their statement, and the two claimants for the honor of the discovery have themselves given it up.

In the treatment of hospital gangrene, and diphtheritic and pultaceous inflammation of the mouth, which so often causes fatal gangrene of the cheeks in children, the treatment by chlorides has proved very successful, according to Percy (Mérat et de Lens), Darling (l. c.), and Roche (see Chevalier) and Bonneau, physician to the Children's Hospital at Paris, (Blache: "Dict. de méd.," 2e édit., t. VIII., p. 434). The latter uses exclusively the dry chloride of lime. He commonly takes a piece of paper, rolled up, wets the surface by dipping it in water, then dips it into a bottle of the chloride, and passes it, covered with powdered chloride, over the affected parts. After a minute or two he causes the patient to gargle in order to get rid of the chlorine, which might irritate the neighboring parts.

Dr. Hervieux has very recently proved the very remarkable efficacy of a dressing of chloride of soda, diluted with three, four or more parts of water, according to the irritability of the part, and applied on pieces of sponge to ulcers of bad character.

M. Siméon proposes chlorine in poisoning by hydrocyanic acid, the chlorine combining with the hydrogen and setting free cyanogen. Orfila finds the antidote very effective; he uses a mixture of four parts of water and one of solution of chlorine. Mialhe prefers to pass under the patient's nose a compress wetted with vinegar-water into which chloride of lime has been put.

Silver.

Solutions of nitrate of silver have been used locally and with success in inflammation of all the mucous membranes—as the conjunctiva, the nasal fossæ, the pharynx, the mouth, the vagina, cervix uteri, urethral canal, and bladder. Chronic inflammations within the cavity of the neck of the womb or on its surface are particularly benefited by nitrate of silver, solid or in solution; especially in cases of erosion, granulation or ulceration, accompanied by an abundant muco-purulent discharge, or loss of blood, which often fatigues or exhausts the patient.

Many acute inflammations are similarly relieved, as diphtheritic angina, croup, catarrhal angina, œdematous angina, acute blennorrhagia, the most intense blennorrhagic ophthalmia, purulent ophthalmia and dysentery.

A somewhat severe attack of quinsy may very often be aborted by cauterization with the crayon or the concentrated solution, provided the application be made at the beginning. At a later period the same application may shorten the duration of the disease. The relief is almost immediate; the pain and difficulty in swallowing subside almost instantly.

In order to make the cure complete, it is sometimes necessary to repeat the cauterization once or twice, at the interval of twelve or twenty-four hours. The same treatment is used successfully in scarlatinous angina of the tonsils, with the effect of cutting it short or at least diminishing considerably the symptoms, when they threaten to become unusually grave, owing either to excess of inflammation or to a complication with diphtheria.

At the beginning of a cold, Tessier, of Lyons, uses with success a weak solution of nitrate of silver as an abortive; it is spread repeatedly over the nasal cavities.

For the skin, when in consequence of inflammation it is converted into a highly vascular membrane (as the surface of ulcers); in fistulous passages; in the various chronic cutaneous affections, the topical applications of nitrate of silver are very often successful; and in a great many cases of skin diseases it was Alibert's principal remedy.

It appears, therefore, that nitrate of silver has been used with benefit in the majority of inflammations of the skin or the mucous membranes. Yet we may say that it is best indicated, and shows its curative powers in the highest degree, in specific inflammation and ill-conditioned sores, or generally in diseases which do not proceed frankly to resolution. It is in general use for venereal inflammations. Acute vaginitis is now attacked vigorously with the crayon, or preferably with more or less concentrated solutions, which are painted over the whole surface of the vulvo-uterine canal. In certain forms of blennorrhagia in men, quite strong injections are in very frequent use; but if the disease is limited at first to the fossa navicularis, cauterization with the crayon often causes it to abort, according to Cahen.

Nitrate of silver incorporated with lard was long ago used in certain ophthalmias of the lids. Jobert (de Lamballe) used it locally in the erysipelas and the inflammation of the lymphatics and veins which follow wounds and surgical operations. He believes that surgical erysipelas does not differ from that due to internal causes, both being dependent on a special condition of the system. He further thinks that the local manifestation of the general condition deserves the most serious consideration, and that, while seeking to reclaim the general condition, we must at any cost extinguish the erysipelatous region, which, after great operations or wounds, is sufficient to cause death. He has a pomade containing one or two parts of nitrate of silver to four of lard, which he spreads twice a day over all parts of the skin that are attacked or threatened with inflammation. This ointment blackens the parts, and causes a strong sensation of burning, with a very acute vesicular inflammation; but the erysipelas usually disappears, and is fixed in the region where the inflammation caused by the ointment exists. The nitrate of silver ointment is now preferred by some to croton oil for producing local inflammations; but it gives a very disagreeable color to the skin, and an indelible stain to the clothing.

In pruritus of the vulva, that so troublesome and so obstinate disease, almost always due to a herpetic irritation of the skin which spreads to the mucous membrane of the labia and vagina, washes, cauterizations or injections with a solution of nitrate of silver render more marked service than calomel and sublimate.

In eruptive diseases, including small-pox, impetigo and zona, several practitioners have followed the advice of Bretonneau of Tours, and directed a light cauterization of the derma on which the pustule or bulla is situated with nitrate of silver, in order to produce abortion of the local inflammation.

A superficial application of nitrate of silver causes large granulations upon the surface of ulcers to disappear very rapidly. Ducamp applied the analogy to the treatment of engorgements of the mucous membrane of the urethral canal; and the value of this remedy is now well known. We have used the same treatment to produce resolution of chronic engorgement of the tonsils; and have thus often cured an affection for which the only resource used to be extirpation.

Contractions of the nasal duct, the internal and external auditory meatus, the nasal fossæ, and even the lower part of the rectum, have been cured by this treatment, which must be governed by the condition of the parts, the severity and duration of the disease.

We might speak of the value of local applications of nitrate in superficial ulcerations of the cornea, the buccal mucous membrane, the glans, prepuce, etc. It would be impossible to quote the multitude of cases in which it has been used; there is no agent in medicine that is more frequently used. But we may sum up by saying, that it is of very special service in a great many acute or chronic inflammations of the skin and mucous membranes; its efficacy in these cases is so well established that it deserves the name of the antiphlogistic caustic.

Subcutaneous Injections of Nitrate of Silver.

Until very lately, the use of irritants as revulsives has been confined to the coverings of the body—the skin, mucous membranes, membranes of the bladder, etc. A distinguished physician of Rheims, M. Luton, has introduced these agents into the subcutaneous cellular tissue, and even the parenchyma of the viscera. He gives to this method the name of parenchymatous substitution (Acad. des Sciences, 28 septembre, 1863). He has employed many irritant substances—solution of chloride of sodium, alcohol, tincture of cantharides, of iodine, etc.—but he prefers to all these the solution of nitrate of silver, one part to five or ten. When first injected, it causes a severe pain, which grows less during the day, so that the patient can almost always sleep on the following night. The pain is usually less on the next day, but soon reappears; and a boil is formed which almost always has to be opened from the eighth to the tenth day.

The discharge is at first a sanious, blackish, thin pus, containing rags of mortified cellular tissue; it afterwards improves and the abscess heals. When only a few drops are injected, a regular furuncle is developed.

This method, then, gives pain for ten days. But if we consider that most of the affections for which it is used threaten to last a long time, or had produced atrophy of the limb (as sciatica), we shall not find the price too high to pay. For neuralgias of the face and trunk the case is not quite the same, and there are few who would care to risk a phlegmon of the face.

Thiersch, pursuing his method of injecting modifying substances into tumors, employed for cancers a solution containing 2 parts of nitrate of silver to 1,000 of water: and then, to prevent the diffusion of the caustic (though probably there is no need to fear it), he used a second injection of chloride of sodium containing 1 part in 1,000 of water. The silver injection amounted to 30 or 40 grammes (ʒ viii.—x.) of fluid; that of common salt, to 15 or 20 (ʒ iv.—v.). His intention was to impregnate the elements of the neoplasm and produce atrophy. He pierced the tumor in all directions, to reach as much tissue as possible. This painful operation required the employment of anæsthesia by chloroform. It gave small results, and Thiersch afterwards proposed to make the injection by the arteries (*Wiener Wochenschrift*, June 26, 1867).

The indications and rules for the use of nitrate of silver are given in the chapter on irritants.

Sulphuric Acid.

Sciatica.—The treatment of sciatica by sulphuric acid originated with Legroux of the Hôtel-Dieu (*Bulletin de thérapeutique*, septembre et octobre, 1852). It has replaced with advantage the cauterization by hot iron, the accompaniments of which are always terrifying. His example has been followed by some others, among whom may be named Loiseau of Paris, H. Gintrac of Bordeaux, Dubourg of Marmande, and we have often used it ourselves. The method usually causes the successive disappearance of all the painful points, and in a short time the majority of the patients are cured, and the rest markedly improved. This result is the more valuable, as sciatica is notoriously the most obstinate of all neuralgias.

Legroux's method, which we also follow, is thus described.

One or two tablespoonfuls of commercial sulphuric acid are put into a plate; a piece of cotton wadding is dipped into it, and the painful portion of the sciatic nerve is stroked with the cotton from above downwards. This leaves a stripe about 3 centimetres broad (1⅛ inches), and of a length proportioned to the number of painful spots. If the whole length of the nerve is abnormally sensitive, we do not cauterize all at once the whole length, but only one-third or one-half of the most painful part, to avoid too extensive a burn. We also avoid covering the bony prominences, in

order to leave the patient free points for his body to lie upon. If suppuration ensues, we find it well to dress with an astringent solution, usually of tannin, which coagulates the gelatine produced by the cauterization.

Sebaceous tumors.—Specialists have long competed with surgeons by the announcement that they cure tumors with caustics instead of the knife. If the word "tumors," which is far too general and pretentious, be replaced by "sebaceous tumors," it will give the truth. The things which are removed by acid caustics are wens and lipomata.

When we can see over a lipoma the point formed by the closed orifice of the follicle, the destruction of a small portion of skin at that point will suffice for the removal of the cystic pouch; but when, as is most common, the point is not visible, the whole or a great part of the skin over the tumor is destroyed. As the cyst has hardly any attachment except that to the skin, from which it receives its vessels, it shrinks after the operation, and is cast off with the eschar. There is sometimes a difficulty. The hairy scalp is one of the favorite seats of the disease; when the tumor occupies that situation, it may become adherent to the pericranium, and remains so when the eschar is detached. This complication may be foreseen, for it is easy to learn beforehand whether or no the tumor is fixed by its lower surface; and there will be no serious obstacle if the adhesions are slight, as they may be destroyed with the scissors without much risk.

Dr. Chairou, physician to the convalescent hospital of Le Vésinet, prefers as an acid caustic the "pâte safranée-sulfurique" of Velpeau, which he uses for extracting sebaceous tumors as M. Gillet of Grandmont uses chromic acid. His results were communicated to the Société de Chirurgie (November 10, 1869), and reproduced in M. Neyreneuf's thesis. He has extracted 33 sebaceous cysts from 11 persons. The eschar generally fell from the 10th to the 35th day; the sore was dressed with a simple piece of dry charpie, and healed in a few days.

Zinc.

We shall speak hereafter of oxide of zinc, which we have classed with antispasmodics in accordance with the custom of most of our predecessors, though we, for want of conclusive experience, are not able to affirm positively that such are its powers.

We shall review briefly first the soluble preparations, the chloride, sulphate, and acetate of zinc, and afterwards the insoluble preparations, the oxide and carbonate.

Chloride of zinc is used internally as an antispasmodic; it is dangerous, and less useful than the other preparations of zinc. We shall give our chief attention to its external use. It is caustic, but in a less degree than those which we shall mention. When applied pure and in powder to the epidermis, it inflames it, and in six or seven hours causes a grayish

eschar, which is detached a little more quickly than those produced by caustic alkalies. This caustic property has been utilized by some modern physicians. Hanke of Breslau used it to destroy nævi materni, fungus hæmatodes, malignant pustules, and syphilitic ulcers of carcinomatous appearance (*Bulletin des sciences méd. de Férussac*, t. X., p. 74; *Journ. de pharmacie*, t. XVI., p. 549). More recently M. Canquoin, who pretended to possess a secret remedy for cancer, was obliged to publish it after it had ceased to be a secret; but from that time, the famous remedy worked no more miracles, and was forgotten as soon as known. His caustic paste has little effect upon skin covered with epidermis, which must be first stripped off by the aid of ammoniacal ointment; the paste is then applied for one or two days according to the depth to which it is desired to cauterize the tumor. This method is very slow, and is so horribly painful that the most courageous often refuse to have it repeated.

We cannot here discuss the comparative advantages of the caustic method of treating tumors as compared with that by the knife. We will only name the writings of Estor ("De la méthode cautérisante," in *Journal de la société de médecine pratique*, 1840); of Girouard ("Étude pour le chlorure de zinc," *Revue médico-chirurg.*, 1844); of MM. Salmon and Maunoury (*Gaz. médicale*, 1859); and the "Thèses of the Faculté de médecine of Paris," sustained by MM. E. Bonnet (1843), Hardy (1853), Vieillard (1856), Fontagnères (1869), Simbal (1874), and Philippeaux's "Treatise on Cauterization."

We shall restrict ourselves to a mention of the procedures which have been retained by surgeons.

Fistulas of various kinds are daily treated at the Val-de-Grâce by M. Gaujot, with arrows of chloride of zinc, as recommended by MM. Salmon and Maunoury.

Maisonneuve does not destroy the tumor from without inward, but forms a sort of trench between the affected and the healthy portions by pushing in fragments of chloride of zinc paste, cut into "arrows," or triangular pieces, each measuring a centimetre or a centimetre and a half at the base, and 10 to 15 centimetres (4 to 6 inches) in length. As this substance has little action on the skin, a puncture is first made, which is pushed as deep as the limits of the lesion, if possible. The blade of the bistoury is then withdrawn, and in its place is inserted an arrow, which is broken off at the level of the skin. The arrows are thus placed like the spokes of a wheel or the slats of a Venetian blind, with intervals of only 2 centimetres (0·8 in.), which is sufficient to enable the adjoining arrows to destroy the tissues between them.

In two or three hours the action of the caustic is marked by a little grayish line surrounding the base of the arrow. In six hours this space has a breadth of about 2 millimetres (0·08 in.); and, in 36 hours, of one centimetre (0·4 in.). During this time the arrow softens, but does not become fluid. When well formed, the eschar is surrounded by a line of demarcation which increases by degrees, but never exceeds 1½ or 2 centi-

metres (0·6—0·8 in.). Elimination begins at the fifth day; and, if the arrows have been well placed, so as to form a complete trench, the tumor falls on the eleventh day.

It is remarkable that the chloride of zinc prevents the tumor from putrefying, but embalms it, as it were. The sore left by the fallen eschar is red, covered with granulations, and quickly heals if it rests on a completely healthy tissue.

Professor Richet (*Gaz. des hôp.*, juillet, 1869) has proposed to treat sebaceous cysts by injecting into their interior a very small quantity of a solution of chloride of zinc by a subcutaneous syringe. On the third day the hole made by the needle becomes more distinct; it is marked by a small crust, which increases by degrees; from the eighth to the twelfth day it is large enough to enable us to enucleate the tumor by simple pressure.

Nitrate of zinc, ZnO, NO5, 3HO.—This salt has lately been proposed as a substitute for the chloride by M. Latour, chief apothecary at the military hospital of Lyons. It is obtained by the reaction, in the warm, of nitric acid diluted with its own bulk of water, upon commercial zinc in excess. The filtered liquid is evaporated by a gentle heat until a slight ebullition is produced, which shows that the necessary point of concentration is reached; and the liquid is allowed to cool.

For a paste analogous to Canquoin's take 2 parts of saturated solution and about 1 part of flour.

Oxide of zinc.—The oxide and carbonate are used externally in ointment or powder, for chancrous, fetid, etc., ulcers, fissures of the breast and lips, intertrigo of children, chronic ophthalmia, and coryza; suspended in mucilaginous water, they are used for leucorrhœa, blennorrhagia, etc., etc. The amount used is nearly unlimited.

Sulphate of zinc.—The sulphate, carbonate, oxide and acetate of zinc have been used internally as antispasmodics. But all of these have been chiefly used as local remedies, and all fulfil nearly the same indications; though the soluble preparations are in general very irritating, and must only be ordered in very small doses, while the carbonate and oxide may be used in much larger doses.

Sulphate of zinc internally is used only as an emetic, which, according to the experiments of M. Toulmouche, of Rennes, is more certain than tartar emetic, and may be compared with sulphate of copper. It is given for this purpose in the dose of 40—75 centigrammes (gr. 6—12) dissolved in 100—125 grammes (℥ iii.—iv.) of water. This is much used by our neighbors beyond the water, and perhaps we should do well to imitate them; it is especially adapted to cases of poisoning, as it produces vomiting more promptly and much more surely than tartrated antimony: in this case it is given in a somewhat larger dose than that just mentioned; and, if the poison is a narcotic, twice or three times as much should be given.

Aran, following Baly, recommends sulphate of zinc as useful in the constipation of nervous persons.—Sulphate of zinc, ¼ gramme (gr. 4);

bread-crumbs, q. s.; f. pil. xii. and silver them. One pill directly after eating; from 3 to 5 a day, or more.

Sulphate of zinc is given very often externally. In acute and chronic catarrh of the mucous membranes, it is useful to place it in contact with the diseased surfaces. In conjunctivitis, nasal catarrh, and urethritis, it is used in the proportion of from 1 to 10 or 20 centigrammes (grs. 0·15—3) to 30 grammes (8 ounces) of distilled water; in leucorrhœa, it is injected in the dose of 2—8 grammes (grs. 30—120) to 500 of water (1 pint); the same in gargles for chronic throat complaints.

Lasègue gives it as an injection in dysentery—3 grammes to 250 of water (gr. 45—ʒ viii.); he calls this his intestinal collyrium.

A one per cent. solution of the sulphate is by far the best local remedy for blennorrhagia after the acute stage. It may be given when the discharge ceases to be purulent, and becomes mucous and catarrhal. This may be recognized by the fact that while purulent, the discharge is not adhesive; but, as soon as it becomes mucous, it sticks to a piece of cloth, and may be drawn out in a thread, of a length proportioned to the amount of mucus present.

A cloth is not always necessary, for when the patient uncovers his glans the liquid, adhering to the prepuce, may form one or more threads of mucus. We can then say that recovery is not distant, and may soon be attained by the use of sulphate of zinc. The same phenomenon may be noticed at the close of purulent ophthalmia in children or adults.

It is added to baths, in the amount of 60—120 grammes (nearly 2—4 ounces) to relieve the itching caused by prurigo, chronic eczema, and, in general, by the herpetic affections.

Sulphate of zinc, closely united with alum, by fusion in a porcelain capsule, was lately presented by Dr. Richard of Soissons, as one of the most prompt and certain means of relief for pruritus pudendi; as these substances are both valuable when used separately, we may believe that when combined, they acquire a still higher efficacy. They form a new remedy, not to be neglected in so troublesome and often obstinate a complaint.

Acetate of zinc is never used internally. Externally, it has exactly the same use as the sulphate. Dr. Pujet employs the solution as a topic, giving it in baths, or leaving it in contact with the skin for one or several hours.

Zinc, exposed to the air and used for roofing or gutters, forms with the rain only a small amount of an insoluble salt; and the same is true of the tanks of zinced iron which are used in the navy. The water kept in such tanks is very limpid, and that collected on zinc roofs is also very healthy (Bouchardat and Fonssagrives, *Bull. de thér.*, 1864, t. LXVII., p. 70).

For Valerianate of zinc, see Valerian.

Copper.

Metallic copper is no longer used in medicine; a few salts represent it, namely: ammoniated copper, the diacetate, the subacetate, and the sulphate.

Ammoniated copper.—This is mostly used externally, yet it has been given by some for epilepsy in the dose of 10–50 centigrammes (gr. iss.—viii) daily. It is regarded by Dr. Mercy, physician to the Children's Hospital at Pesth, as an almost infallible specific for St. Vitus' dance. He combines 40 centigrammes (gr. 6) of the salt with 100 grammes (ʒ xxv.) of mint-water and about 30 grammes (℥ i.) of simple syrup, to which he adds 6 or 8 drops of tincture of opium, to assist toleration. A child of six years receives of this two teaspoonfuls four times a day, which dose is rapidly increased, if the stomach bears it, till 40 centigrammes of ammoniated copper (gr. 6.) are taken daily. He states that among more than 200 cases he has almost always seen the chorea depart so quickly that the relation of cause and effect has been unmistakable.

Placed in contact with the skin and mucous membranes, it causes a violent irritation.

It forms the *eau céleste* so much praised in the treatment of chronic ophthalmia, for which purpose it is used in the proportion of a few drops to the ounce of distilled water, increasing the proportion as the sensibility of the conjunctiva diminishes. It has been of equal use in blennorrhagia, leucorrhœa, and chronic ulcers. M. Cullerier makes a mixture of 28 grammes of ammoniated copper with 4 of nitrate of mercury to touch venereal ulcers which resist mercury.

It is not used internally; externally it forms an ingredient of a great many ointments and powders, formerly of much celebrity in the treatment of ulcers and chronic diseases of the skin. Dissolved in water in various proportions, it is, like the sulphate, of which we shall presently speak, useful in chronic ophthalmia, blennorrhagia, syphilitic or simple ulcers, dartres, and especially eczematous dartres.

Subacetate of copper, verdigris of commerce (æs viride, viridis æris, ærugo rasilis) shares all the poisonous, irritant, purgative and therapeutic properties of the diacetate of copper.

In pharmacy it is used in a multitude of plasters and salves, which are not without use in external diseases.

It has been given internally. It formed the essential element of the famous Gerbier's cancer-pills, which cured some patients as long as the composition remained secret, but have been found completely inefficacious by experience. It has been recommended in rickets and scrofula, but the facts are so inconclusive that we pass over them.

Sulphate of copper is a very powerful irritant poison. It forms the most certain emetic we know of, in the dose of 25—40 centigrammes (gr. 4—6). It has been thought especially valuable as an emetic in croup.

The recent observations of MM. Godefroy and Mavel would seem to show that the frequent use of a solution of sulphate of copper is very rapidly beneficial in malignant angina. A spoonful is given every ten minutes of a solution containing 10 centigrammes in 125 grammes of distilled water (gr. $1\frac{1}{2}$ — ℥ iv.). We have seen two very severe cases where we thought the disease had been cured by this remedy.—We consider this a case of substitutive medicine, like the use of calomel, alum, or nitrate of silver.

We have lately given sulphate of copper in the dose of $\frac{1}{2}$—1 gramme in an injection for chronic diarrhœa, and we often find it very useful, in very much the same way as nitrate of silver is. The solution of sulphate of copper is also used (2 grammes to 500 of water) for catarrhal leucorrhœa; injected morning and evening.

The sulphate, as a collyrium, is used in the proportion of 0·05 to 30 grammes ($\frac{1}{6}$ of 1 per cent.); it is still prescribed under the name of eau céleste or pierre divine.

Diacetate of copper (deutacetas cupri, crystallini veneris) when in contact with a mucous membrane, or the skin deprived of its epidermis, produces a very active irritation: it is a very powerful poison.

Antimony.

Antimonial ointment is rarely used as a revulsive for two reasons: the inflammation cannot be restricted to the superficial part of the skin, and it leaves horrible scars. The application is made upon the chest; and when the patient is a little girl, we leave upon her a mark which she may find very undesirable.

Sebaceous cysts.—The attempt has lately been made to cure these without a visible scar by tartrated antimony. The disease is innocent, but is almost always seated in some exposed part, usually the head or face. The patient is urgent in his request to be relieved of the disfigurement—but he also insists on being cured without risk and without a noticeable scar, since otherwise the remedy might be worse than the disease. Caustics may be used without danger; we have given directions for the use of Vienna paste, sulphuric acid, nitric acid, chromic acid, chloride of zinc.

One of the simplest methods of using tartarized antimony has been popularized by M. Boeckel. The method consists in injecting a solution of one part in 30 of the salt into the tumor with a Pravaz syringe. When the tumor is not larger than a hazel-nut, he punctures it with the needle of the syringe, turning the latter about so as to divide any septa that may exist; then, if very sure that the point is in the cyst, he injects about one gramme of the solution (gr. 15). It is necessary to avoid piercing entirely through the cyst, as, if the fluid were injected into cellular tissue, it might cause a phlegmon.

When the injection is well performed, and we are sure that no fluid

has passed into the connective tissue, the tumor seems, directly afterwards, to be increased in bulk. The opening then cicatrizes. On the next day, and afterwards, the skin over the cyst is slightly reddened, and the inflammation increases until the third day. On the fourth or fifth day the puncture opens again and discharges a small quantity of pus mixed with a little blood and more sebaceous matter. On pressing the tumor, the contents are easily pressed out; the entire sac, when it does not come out easily, is grasped with a forceps or hook. A little pus escapes for two days more, and on the eighth day all is healed.

The author of the treatment faithfully records the accidents. In one case, where the tumor was seated at the level of the eyebrow, the cellular tissue of the lid was inflamed and several incisions had to be made. In two other cases the pouch did not come out, but the improvement was considerable (Greuell: "Thèse de Paris," No. 359, 1872).

Mustard.

Two species of mustard, the white and the black, have been used in medicine; the white is preferred for internal use, the black almost exclusively for external use.

White mustard, sinapis alba.—When a remedy is popular, when quacks have long used it, and always with advantage, it must have some valuable properties, which the obstinacy or ill-humor of physicians may deny in vain.

The use of mustard-seed in medicine goes back nearly to the last century; Cullen states it most positively ("Mat. méd.," t. II., p. 180); he used it as a laxative. Maccartan, an Irish physician residing at Paris, published in the *Journal général de médecine* (t. XXXIV., p. 72, 1809) a paper on its therapeutic properties; this had no influence on practice, because his facts would not stand examination. Nevertheless, in England and North America the use of white mustard-seed had become popular, and a few years later it was so in France. From our own observations we can state that this is a very useful remedy.

Cullen remarked its laxative effect. It purges in the dose of 30 to 45 grammes (℥ i.—iss.). It is given whole, on a fasting stomach, at bedtime or just before eating. The dose varies with each person, but should be sufficient to procure one or two easy evacuations daily.

This kind of purgation causes no colic, and is of especial use to those who are habitually constipated, and whose digestion is laborious. We have found it especially useful to those suffering with piles. The physician must decide whether this digestive torpor depends on inflammation, in which case the use of white mustard-seed would not be indicated.

Popular opinion ascribes its chief virtue to its depurative function. The question must be examined, first by experiment, next by theory. All the evidence shows (and our own experience does not permit us to

doubt it) that this substance has a very powerful depurative action; cutaneous diseases and chronic rheumatisms, which nothing could benefit, have been cured or placed in a way to be cured by the long-continued use of white mustard-seed. This fact is to be explained as follows:

Must not the permanent irritation of the surface of the digestive mucous membrane, producing as it does a continual secretion of mucus, be considered as a derivative act, and may we not explain the disappearance or diminution of a disease by this derivation alone? This view seems to us the more reasonable, as frequent purgation has been regarded by all physicians as an efficient treatment of chronic diseases of the skin. And again: if we remember that mustard-seed only keeps the bowels a little relaxed without causing active irritation of the mucous membrane, and that drastic purgatives, though they stimulate that surface much more actively, do not cure dartres and rheumatisms so surely, we shall be forced to infer that there is in mustard, as in most other cruciferæ, an active principle which probably modifies the blood and consequently the whole system. Perhaps this active principle is only sulphur, which is known to exist in a considerable proportion in all the plants of this family.

Whatever be the explanation (we do not attach much importance to our hypothesis), we appeal to the facts alone, and call attention to a remedy which, because too well known, is too little appreciated.

From the seed of sinapis alba are made most of the mustards eaten at table. This article, well appreciated by old men and by persons whose digestion is sluggish, is unjustly condemned by certain physicians. It is certainly not appropriate to those who digest laboriously, as they have an acute or subacute gastritis; but in certain chronic forms of gastritis, in a great many gastralgias, and in general, in those affections of the digestive tube in which the muscular layer is evidently inert, and the normal secretions of the mucous membrane are almost entirely suppressed, mustard, taken from time to time, is of use, and becomes almost a necessary condition of good digestion.

Black mustard (sinapis nigra) is most commonly used externally. It is ground, and used in sinapisms, cataplasms, mustard-baths, etc. It is one of the most common remedies; and yet its mode of action is not generally well known.

In almost all the books on materia medica, in the majority of articles in dictionaries, we are struck with the discrepancies between authors. Some recommend mixing with warm water or warm vinegar indifferently; others prefer vinegar or concentrated acetic acid, to produce a more active effect. Some expressly direct the choice of freshly ground meal; others direct only the use of the bran. As regards the period of application, some have it four hours in contact with the skin, some two or three hours, others an hour or an hour and a half.

What are the readers of books to do?—Not knowing how to decide, we did what we might have done at the beginning; before writing we

made experiments, and we shall now give their results. They were made in 1829 and published in 1830, and confirm the chemical results of M. Fauré and the more recent ones of M. Boutron.

1st question :—Should the mustard be freshly ground, or long ground?

We mixed two portions of mustard in cold water. One had been ground a week, and kept in a closed box; the other, five months, and kept in a paper bag in a damp chest of drawers. The two were applied to the right and left thigh respectively.

Fresh Mustard.	*Old Mustard.*
After 4½ min., slight prickling,	4½ min., no sensation.
5 min., a little heat, slight throbbing synchronous with pulse.	5 min., no sensation.
6 min., lively smarting.	6 min., slight prickling.
7 min., smarting increases.	7 min., slight smarting.
8 min., smarting very intense.	8 min., smarting lively, arterial pulsation.
9 min., the pain becomes deeper; sensation of weight in the part in contact with mustard.	9 min., sensation of burning; pain becomes deeper.
10 min., sensation of heat and burning; very hot.	10 min., sensation the same as in the other leg.

The experiment always gave the same result. Old flour acted at the end of ten minutes exactly in the same way as new, though it began to act much more slowly. There is, then, no remarkable difference between black mustard ground a week and that which has been ground five months.

2d Question.—Does a sinapism prepared with hot water act more quickly than one prepared with cold water?

We applied two sinapisms, one prepared with water at 40° (104° F.), and the other with water at 15° (59° F.).

Cold water.—See the first experiment.

Warm water.—Two minutes, slight sensation; 3, a little smarting; 4, acute smarting, slight arterial throbbing; 5, painful smarting, throbbing very perceptible, pain more profound; 5½, pain very acute and violent; 7, pain no longer sensibly increasing; afterwards it becomes more profound; the arterial throbbing is less energetic; 10 minutes, same condition.

We see that the one which was prepared with warm water acts much more quickly than the cold one. But, after all, at the end of ten minutes the effects are exactly alike. This is easily understood, since the time is sufficient to enable the temperature of the skin and the sinapism to become equal.

We do not conclude that it is indifferent whether we apply it warm or cold: the sensation of a cold body applied to the skin must certainly in certain cases be injurious. But the temperature of the application is so speedily equalized with that of the skin, and the blood comes so quickly

to the derma, that we regard the fears entertained by some therapeutists as greatly exaggerated. But it is important to add that if the sinapism had been prepared with boiling water instead of water at 40°, it would certainly have lost its irritating power.

3d Question.—Does mustard flour mixed with vinegar act with more power than that mixed with water?

Water.—See first experiment.

Vinegar.—Fifteen minutes, slight smarting; twenty, smarting a little increased, but hardly appreciable; twenty-five, it becomes a little more active; fifty, a little more decided, nearly equivalent to that which the sinapism made with water causes at the end of six minutes.

This experiment was made several times upon different persons, and gave constant results. Comparing the time required to produce a certain result, we might say that the degree of activity of the one is to that of the other as 6 to 50, or 1 to 8.

In these experiments the vinegar was cold. Wishing now to ascertain whether warm vinegar acted more energetically, we made the experiment, but found an entirely negative answer.

Wishing to see whether the dilution of the fluid (table vinegar) used in these experiments might have affected the results, we now mixed the mustard flour with equal parts of water and concentrated acetic acid, and obtained the following result:

We left the sinapism 45 minutes in contact with the skin, without producing the least sensation of stinging.

Finally, we prepared two sinapisms, one with concentrated acetic acid, and the other with water. The results are so extraordinary that we place them side by side.

Water.	*Concentrated Acetic Acid.*
6 min., slight prickling.	6 min., nothing.
7 min., active stinging.	7 min., moderate stinging.
8 min., active stinging and arterial pulsations.	8 min., stinging a little increased.
9 min., sensation of burning.	9 min., pain less than in the other sinapism.
10 min., very painful; removed.	10 min., stinging rather sharp; light arterial pulsations.
	11 min., stinging painful; sensation different from that produced by the other.
	12 min., sensation of burning; removed.

One would hardly have supposed a priori that concentrated acetic acid would act with less energy than water in a sinapism.

Having seen that concentrated acetic acid had almost no activity when mixed with mustard, we were curious to know if a cataplasm made of sawdust with the same acid would be more active than the sinapism; in consequence, we made a paste of the acid and the dust of our writing-

desk, and applied it upon our own leg. In a minute and a half acute stinging was felt; in two minutes the pain was severe; half a minute later it was insupportable, and in three minutes it was so violent that we were forced to remove the application; but the skin was severely cauterized.

Mustard, therefore, when mixed with water, acts more energetically than when mixed with common vinegar, weak or strong acetic acid; and acetic mixed with mustard loses some of its efficacy. The mustard is weakened by the acid, and the acid by the mustard.

If we wish to produce active rubefaction and even a superficial burn of the skin, it is sufficient to place acetic acid for three minutes in contact with the skin, in a sponge or some inert powder; and certainly, no sinapism will act so speedily. But if we want a sinapization, that is, a modification of the skin which produces a *sinapic* sensation, redness and swelling (the expression is exact), we require mustard and water. And when we wish to mitigate a sinapism, instead of adding flaxseed, breadcrumb, or yeast, it is sufficient to prepare it with vinegar.

All the vinegar-makers in the world teach their apprentices the art of correcting the sting of mustard with vinegar; the useful lesson has not been lost on everybody. Aetius insisted on the point when he said: "Sed et hoc noscendum est: si in aceto maceretur sinapi, inefficacius redditur; acetum enim sinapio vim discutit" ("Aetii de atrabili, sermo tertius. Sinapismi præparatio"). Schwilgué repeated it in his "Traité de matière médicale," and it was long customary in our hospitals to weaken sinapisms with vinegar. But it is only a little while ago that the contrary was taught in all the courses and the books; which is our reason for publishing these experiments, which have already resulted in making our physicians acquainted with a notion which we owe to Aetius.

Before concluding what we have to say of sinapisms made with water and vinegar, we must say that our own experiments were made with excellent black mustard flour, ground as it is by all the good druggists in Paris; the quality of the flour need not be questioned, as it causes almost insupportable pain in ten minutes.

We procured also some "English flour," which is sold for preparing the fresh mustard of our tables. We mixed this with water, and prepared another sinapism with ordinary black mustard, but the action was identical in the two cases; then mixing with vinegar, we were no little astonished to find the results different from the former ones, for the addition of vinegar did not so completely destroy their activity.

We are entirely ignorant of the cause of this difference. But M. Guibourt has shown that the English flour was not prepared with white mustard seed, but with the black, and the difference between the English and the French flour consisted in the fact that the latter had been passed through a sieve with wider meshes. The only physical difference between the two is, that the French kind is of a dirty yellow specked with brown, while the other, very finely ground, seems free from bran, and is of a uniform jonquil color.

We prepared some sinapisms with alcohol, but they were less powerful than those prepared with mustard.

We will now add some remarks on the direct effects of sinapisms, and will conclude by considerations on the means for soothing the severe pains which the application sometimes causes.

We saw that if the sinapism was prepared with good flour and water, a sensation of prickling occurred at the point of contact within four or five minutes; this became more and more severe, and in ten minutes resembled the pain caused by white-hot iron held a little way from the skin. Almost intolerable in ten minutes, it grows more and more deep, and is soon constrictive and gravative, that is, it gives the feeling of a heavy body weighing on the muscles and compressing them. This sensation is less intolerable than that which preceded it, so that a sinapism can be borne much longer than would have been supposed from the severity of the first pains. But when the calm, or rather the change in the character of the pains has lasted twenty or twenty-five minutes, the sensation of burning begins afresh, more severe than ever, and the most docile and courageous patients rarely bear three-quarters of an hour of a well-made sinapism unless their sensibility is blunted by an idiopathic or secondary cerebral affection.

When the application is raised, the impression of the cold air almost wholly puts a stop to the pain. The skin is not swollen, and there is hardly any redness; but in a few moments the stinging reappears, the skin is dotted with red points, and soon becomes of a uniform rose color. The stinging becomes more acute and is at last a burning; the least rubbing exasperates it, and the impression of cold lessens it. However lively the redness, there is no very distinct swelling, unless the person is predisposed to œdema. The stinging may last twelve hours, and even a week; it has a special character, and produces, especially in women, a nervous excitability which is not always without danger. We have seen women suffering cruel and unconquerable insomnia, shedding tears, and attacked with quite severe nervous symptoms, so acute were the sufferings.

The redness lasts much longer than the pain, and often exists in a high degree when the stinging has almost entirely disappeared, at the end of eight or ten days; but in this case an itching appears every evening, which is by no means painful, but rather pleasant to scratch.

When the sinapisms have been long applied and often repeated, though they may not have caused blisters, they may leave yellow spots, which are sometimes indelible.

A sinapism must be applied a long time to produce vesication; and the ampullæ appear much later than when cantharides are used. The phlyctenæ do not rise all at one time, so as to form one large bulla, but are developed partially and successively.

Such are the effects of a sinapism prepared with water, on the skin of most persons, when applied not longer than fourteen or fifteen minutes. Some persons are less irritable, and resist the action of mustard; but on

experience shows that it is usually injurious to let it remain an hour; we consider the direction sometimes given, to leave it three or four hours in contact with the skin, as very dangerous.

We know a lady who, at the age of twenty, had convulsions during childbirth, in consequence of which she fell into a profound coma; the physician bled her, and applied at the same time four sinapisms, two on the wrists and two on the ankles. The mustard remained on but three hours, and though the patient gave no sign of sensibility during that period, yet eschars were afterwards formed, and she nearly fell a victim to the excessive activity of treatment.

In circumstances like this it is important to know how long a sinapism may be applied, since when consciousness is suspended the remedy may exhaust all its activity on the skin before the brain is informed; and when consciousness returns, we are surprised to hear the patient complain of frightful pain, a symptom of profound lesion of the skin.

The same caution is applicable to those febrile affections in which the nervous centres are deeply involved. Thus, in dothinenteritis or scarlatina, complicated with ataxo-dynamic symptoms, etc., sinapisms are sometimes left on for ten or twelve hours, the patient meanwhile showing no sensibility, though the skin is red and phlyctenæ are formed. Two or three days later, when the sensibility returns, the pain becomes insupportable, and a new fever is kindled; the skin becomes gangrenous, and in some cases the remedy is accused of causing death.

We conclude that a sinapism prepared with water ought never to be left applied more than one hour; that, even when no complaint is made, it must be removed at that time; and that, if we desire the effect to be produced slowly, and the mustard to remain applied for several hours, we must mix with vinegar in order to moderate the activity, or change the position every quarter of an hour.

Two things have prevented physicians from understanding the degree of activity which sinapisms possess: first, the belief that they are never so active as when made with vinegar, and second, the adulteration of the remedy.

Many pharmacists, even in Paris, have no mill to grind mustard, and buy it already ground, of the wholesale dealers. The latter sophisticate it in every way; they add the refuse of colza or flax-seed, and a coloring matter. The only reliance is to be placed on mustard ground in the drug-shops. The family and even the physician do not hesitate to send to the next grocer; and we have seen a poultice made from mustard thus bought, which remained applied eight hours without causing the least stinging, while the same person felt insupportable pain in ten minutes, when a similar poultice of mustard ground by the druggist was applied.

Since this experience, we have several times encountered accidents caused by sinapisms which were not kept on over an hour. We first tried laudanum and the opiates, applied to the inflamed skin, but this hardly lessened the pain, though the dose was carried to the point of

producing intoxication. A much more successful application was found to be:

Unguent. populeum,	.....	15 grammes (℥ ss.).
Extr. belladonnæ,		
" hyoscyami,	.....āā	0·3 " (gr. ivss.).
" stramonii,		

A thin layer of this is to be spread on a cloth and applied to the affected part. A cataplasm composed as follows is equally useful:

Belladonna, leaves and stalks,		
Hyoscyamus, " "	.....āā	8 grammes (ʒ ii.).
Stramonium, "		

Boil in 1,000 grammes (1 quart) of water till reduced to one-half; make poultices with bread-crumb or flax-seed meal mixed with the decoction.

The "baume tranquille" may also be used to anoint with; but alcoholic liquors, such as laudanum, cause extremely severe pains.

If the skin is severely excoriated, these narcotics may cause vertigo and somnolence; the dose must then be lessened, in proportion to the extent of the denuded surface.

As for the special conditions which demand the use of sinapisms, we shall speak of them in the chapter on Irritant Treatment, where their effects will be studied by comparison with those of other agents.

Cantharides.

Physiological Action.

Various insects of the class cantharis contain cantharidin, which is really the only vesicating principle that they do contain. But as the officinal cantharis is the only one generally employed, we will take it as the type.

Cantharides in powder, and the numerous preparations which retain the active principle, are very dangerous poisons. Cases of poisoning are frequently produced by this substance, whether given to excite the venereal orgasm, or to provoke abortion. The ingestion of cantharides, in addition to the gastric symptoms which are common to all acrid poisons, produces special nervous symptoms, as somnolence, delirium, slowness of circulation, and an excitement of the genital organs which is sometimes excessive.

Placed in contact with the skin, the powder of cantharides produces in a few hours a feeling of numbness which is at first hardly painful, but afterwards becomes a sense of painful pressure, and then of burning. The suffering is rarely acute, except the patient makes a good deal of

movement and irritates the denuded papillæ. After a time, the length of which depends on a great many circumstances, the epidermis is raised by small bullæ filled with serum, though the skin is not very red. Afterwards, if the action is continued, the bullæ unite and form a single phlyctena. When removed, it discovers a layer of half-coagulated lymph on the surface of the skin, easily separated, and usually repeated after each dressing, so as sometimes to form a very plastic and thick layer.

These false membranes are easily raised at the first dressings, but afterwards they become more and more adherent, and at last form a sort of artificial epidermis which dries, and under which, after a few days, is found a delicate red epidermis like that of a fresh cicatrix. In other cases, when the action has not been energetic, no appreciable false membranes are formed, but the epidermis is reformed directly from a layer of the liquor exhaled from the skin, which seems to dry at contact with the air.

Besides this topical action, there is a general one, due on the one hand to the inflammation of the skin, however slight its intensity may be; on the other, to the resórption of an irritant element which circulates in the blood and stimulates the different tissues of the system. This fact of absorption is well known by symptoms referred to the kidneys, bladder, and generative organs; perhaps, also these accidents form a partial cause of the general reaction of which we lately spoke.

On the part of the urino-genital system, the symptoms are commonly slight, unless the blister be extremely large, or cantharides have been swallowed. They usually consist of an increase in the quantity of urine, and in the frequency with which it is passed—a frequency out of proportion to the amount passed;—in men, there is heat in urinating, with a tendency to erection; in women, a much more marked burning, and rarely erotic erethism. These slight disorders are not spoken of by the patient unless his attention is called to them; but when the person is irritable, or has taken a great quantity of the drug, or the blister has been too large, or applied to a recently scarified surface, the symptoms have a form and intensity which cannot be concealed. Thus, there is suppression or retention of urine, with a spasm of the urethra which the sound cannot always overcome; acute cystitis or nephritis; painful priapism, which may become inflammation, and even gangrene of the penis; insatiable nymphomania, acute metritis, etc.; but most frequently, symptoms lying between those just described and those named before. Bouillaud and Morel-Lavallée, have lately proved that an albuminous secretion mingles with the urine, under the influence of a large blister, which may easily be proved by nitric acid. Fibrine, also, is secreted, and is sometimes condensed as a false membrane in the bladder, and sometimes is found at the bottom of the urinal.

We shall consider cantharides chiefly as an agent for producing vesication; and shall give from our own experience some directions for dressing the blister and relieving the symptoms which sometimes appear.

If we desire only a flying-blister, the application must last only long enough to raise the skin, a time which varies according to the preparation used, the nature of the patient's skin, the disease—in short, a multitude of circumstances, which must always be taken into account.

As soon as the blister is formed, the vesicant is removed, and at the lowest point an opening is made with scissors, so as to let the serum escape. The epidermis will then be exactly in contact with the chorion, so that the pain will be less at first, and the healing much quicker. The part is then covered with a compress or piece of wadding spread with cerate and held by a proper bandage; this dressing is renewed twice a day, till the exudation of serum is at an end.

We have seen the following dressing used with success:

Starch.....	35 grammes	(ʒ ix.).
Water.....	35 "	
Glycerine.....	220 "	(ʒ lv.).

Mix the water and the starch, add the glycerine, and stir over a fire to the consistency of a cerate.

When the blister is to serve as an exutory, we leave the vesicant on the skin several hours after the blister is formed. The skin is to be entirely removed, and the derma sponged to get rid of the superficial layer of fibrin. The irritation of the skin is such as to require to be lessened rather than increased; the first dressings should not be made with cerate, but with butter, or any fatty body which does not cause too rapid cicatrization. Where a tendency to healing is seen, the butter is replaced by an epispastic ointment or fabric, of cantharides or mezereon, and so on until a new indication arises, observing the following rules. We will suppose the following cases:

The blister dries up or suppurates too freely;

It is covered with false membranes;

It is surrounded with a dartrous eruption;

It is covered with vegetations;

It causes dysury.

A. *The blister dries, or suppurates too freely.*—In certain persons the blisters cannot suppurate, and dry very rapidly, though dressed with ointment active enough to produce in other cases the greatest abundance of suppuration. Some of the causes of this circumstance may be understood, but usually it is impossible to do so, and only the effects are seen. Some persons' wounds heal with great ease, and, as it were, by first intention, and suppuration is established with the greatest difficulty. Others have what the vulgar call humors, and in them the least scratch becomes poisoned, and suppuration seems endless. In the former class, blisters are very hard to keep open; in the latter, but little care is needed to maintain suppuration a long time. In old men, suppuration is very hard to establish in blisters, which is explained by the want of vascularity of

the skin in advanced life; but it is a stranger thing, and one which we could not believe till we had repeatedly seen it, that the suppuration is perhaps even more difficult to maintain in young people than in the old; and if we explained the former case by the deficient vascularity of the skin, we must explain the latter by the excess of plastic force in youth, by virtue of which cicatrization takes place very rapidly.

In any case, experience shows that blisters, cæteris paribus, should be kept open in old men and children with much more powerful applications than those which are suitable for adults. The activity of the epispastic agent should be proportioned to the difficulty experienced in maintaining suppuration.

B. *The blister is covered with false membranes.*—The generally received opinion is, that the excess of cantharidal inflammation is the cause of this supersecretion of false membrane which is observed so often on blisters. It is certain that the action of cantharides produces a pseudo-membranous phlegmasia, as shown by Bretonneau. This physician, by injecting cantharidal ether into the trachea or larynx of dogs, caused a membranous inflammation very like that of diphtheria; a little of the same ether, when applied to the mucous membrane of a dog's lip, caused a detachment of the epithelium in fifteen or twenty minutes, and a false membrane was soon formed underneath, which was easily raised, and for a day or two was quickly renewed.

We have said enough to show that the cantharidal inflammation is essentially membranous; but does it follow that the excess of this inflammation is the cause of the accumulation of successive layers of fibrine? We do not think so. In fact, if the strength of the ointment, stuff, or paper be diminished, we find the false membranes becoming more and more adherent, and the blister drying up. The application of cataplasms, though sometimes recommended with the same object, sometimes softens the false membranes, so that they can be easily raised with a spatula, but at other times it is quite insufficient.

The treatment which succeeds best is directly opposite to this. When the sore persists in forming fresh membranes, which become more and more adherent, we apply a new blister to the spot, or a little ethereal extract of cantharides, and next day we see the false membrane raised as if it were epidermis, and underneath it the derma, perfectly clean. For some days there is no tendency to form fibrinous concretions, but the sore retains an improved aspect, showing that if the cantharidal inflammation was the cause of the production of fibrinous layers, an excess of inflammation seems not to have the same effect; at least, this excess gives rise to membranes which are less dry, less adherent, though more numerous.

When, therefore, the sore of a blister is covered with an adherent false membrane, it is necessary to use more energetic epispastic ointments, plasters and paper.

One exception, however, must be noted here. It sometimes happens that the exposed surface becomes all at once very painful, and covered

with soft, grayish, pultaceous concretions which have a very bad smell. When we try to remove them the blood flows; and the skin which surrounds them has an erysipelatous tint. A more active ointment would only aggravate this condition, which is better suited by emollient cataplasms at first and powdered calomel afterwards, or a cerate made of 1 part of white precipitate to 38 of Galen's cerate; this dressing promptly improves the condition of the sore, and should be continued until the inflammation is gone and laudable suppuration is re-established.

C. *The blister is surrounded by a dartrous eruption.*—It very often happens, to persons subject to dartrous affections, that the skin about the blister is covered with vesicles, at first separate, but afterwards confluent, and forming a genuine eczema; pustules of impetigo may even appear, and an intolerable itching and an acute pain follow. The eczema, at first limited to the arm where the blister was applied, often extends by degrees, in an acute form, to the entire surface of the body. Fever is then kindled, and general symptoms of some gravity may appear.

But in non-dartrous persons, though this extension of inflammation is quite rare, it is, nevertheless, sometimes seen, especially near the blister. The remedies which we have found most useful, while the eczema remains confined to the neighborhood, are at first dressing with a linen cloth soaked in glycerine; and soon after, when the local phlegmasia is lessened, a pomade made of red precipitate 1 gramme, cerate 15 or 25 grammes; applications of a liniment of equal parts of lime-water and sweet almond oil or linseed oil, morning and evening; ointments of carbonate or acetate of lead; washes with Goulard's vegeto-mineral water, etc., the surface of the blister being less energetically stimulated at the same time.

When the eczema is generalized and is accompanied by febrile reaction, a bleeding from the arm, general emollient baths, diet, laxatives, and afterwards full baths containing 10 or 15 grammes (ʒ iijs.—iv.) of bichloride of mercury, will speedily bring relief.

D. *The blister becomes covered with vegetations.*—When the blister has been long and severely inflamed, it is often covered with vegetations like old sores. In this case superficial cauterization with nitrate of silver, or acid nitrate of mercury, the application of powdered burnt alum, sulphate of copper, etc., usually relieve this condition. The blister should be healed, and, if necessary, another one made elsewhere. In spite of this precaution, the cicatrix will remain uneven, sometimes painful, and cure will often be hard to obtain.

E. *The blister causes dysury.*—This usually appears on the day the blister is applied. It is caused by the absorption of cantharidin from the denuded surface. The only remedy is to make the patient drink freely; this increases the quantity of urine, and no irritation of the urinary passages occurs. In very irritable, and exceptionably susceptible patients, the dressing with cantharidal ointment, etc., often affects the bladder. In this case we must immediately substitute mezereon with cantharides, which of itself puts an end to all the trouble.

If we cannot make this substitution, the internal use of camphor, in the dose of 15—30 centigrammes (gr. $2\frac{1}{4}$—$4\frac{1}{2}$) is advisable. If this is not borne, dissolve the camphor in the fatty substances which are used for dressing, and you will very probably avoid the vesical and renal difficulties.

We must add that preparations of mezereon produce very acute pain, followed by bloody irritations.

Therapeutic Action.

In spite of the activity of this remedy (and perhaps because of it), some therapeutists have ventured to prescribe it for internal use, and have been followed by a great number of modern practitioners of good reputation.

The father of medicine, Hippocrates, gave the powder of cantharides in dropsy, apoplexy and jaundice; he recommended it in difficult labors, to solicit the expulsion of the fœtus and placenta. He believed that he had proved its emmenagogue virtues.

Impotence.—The elective affinity of cantharides for the genito-urinary organs was recognized in the first age of medicine. We are informed by historians that they formed part of philters or love-potions. Experience has shown that the internal use of cantharides places these organs in a condition of erethism which is not free from danger, and may at any time cause bloody piss and inflammation of the womb or penis, and even sphacelus of the latter. We advise physicians, if ever inclined to use cantharides for this purpose, to be extremely careful, and to restrain those patients who wish to recall a long-regretted but unseasonable pleasure.

Dysury.—In spite of the imposing authority of Hippocrates, the internal use of cantharides for diseases other than impotence had almost ceased, when J. Groenevelt, an English physician, attempted to reinstate it; becoming, however, the object of very active persecution from his brethren. He gave it chiefly in dysury. With 60 centigrammes (gr. 9) of powdered cantharides and 75 (12 gr.) of camphor, he made two or three boluses, which were to be taken at intervals of four hours (J. Groenevelt: "Tutus cantharidum usus internus," Londini, 1698). Werlhoff ("Commercium litterarium," year 1733) recommends this in dysuria; he gave cantharides without camphor, 5 centigrammes of powder every 4 hours. In dysury of old men, which is often attributable to a semi-paresis of the bladder, this treatment is plainly rational and cannot usually cause any decidedly bad symptoms; but if due to chronic inflammation of the neck of the bladder, such as may be due to a calculus or the frequent tearing of the mucous membrane by gravel, or if due to a serious swelling of the prostate, it is questionable if cantharides will render the same services; these and other considerations have thrown discredit, and still do, upon the internal administration of cantharides.

A little later than Groenevelt, Th. Bartolin gave a vinous infusion of cantharides in blennorrhagia ("Cantharidum usus internus," in "Hist. anatom. cent.," V., hist. 82). This singular remedy, adopted by Werlhoff, was again used and highly praised by Richard Mead ("Monita et præcepta," Londini, 1754), who digested 8 grammes of powdered cantharides in 750 grammes of alcohol (ʒ ii.—℥ xxiv.), of which tincture he gave from 30 to 59 drops morning and evening; and in our times we have seen Robertson, of Edinburgh, treat blennorrhagia with the enormous dose of 15 grammes (ʒ iv.) of tincture of cantharides in 24 hours ("Biblioth. médicale," t. XX., p. 39).

Our view of the action of copaiba in blennorrhagia is that it causes in the mucous membrane an artificial irritation which replaces the morbid irritation. We account in the same way for the action of cantharides in blennorrhagia and the other irritant diseases of the urinary passages; but evidently there is danger here, unless the physician rightly proportions the artificial local inflammation to that already present. We shall give rules for the application under Substitutive Treatment.

Vesical catarrh.—We will here recall what we said above, in speaking of the physiological action of the remedy, and explain how we are justified in comparing the internal use of cantharides up to a certain point with irritant injections into the bladder, or urethra, to relieve inflammation of their mucous membranes.

The writings of Morel-Lavallée, and Bouillaud, and the inaugural thesis of M. Dourif (5 mai, 1849), leave little to be desired under this head.

Bouillaud finds evident traces of inflammation of the kidneys and the ureter after applying large blisters. He has once found small false membranes on the mucous surface of the pelves, and a portion of false membrane at the vesical orifices of the ureters, showing the irritating action of cantharides upon the kidney and ureter. He also found the urine albuminous under the same circumstances.

Morel-Lavallée has proved by autopsies (Andral and Vidal of Cassis state the same) that the bladder and the urethral canal are inflamed by the same cause. He has sometimes seen the vesical mucous membrane covered with a real fibrinous false membrane, and has found such membranes in the chamber-pot.

We shall not speak of the use of cantharides in epilepsy, hydrophobia, hysteria, etc.; the heroic and dangerous nature of a remedy attracts some physicians to use it in treating acute and chronic affections which are thought incurable; and, as it is hard to admit a failure, the value of a remedy is often exaggerated, until the physician comes to deceive himself and others.

Eczema.—Cantharides were anciently used for chronic diseases of the skin, as in the case of that Roman knight mentioned by Pliny, who was killed by drinking a potion which contained cantharides, given to cure an obstinate eruption. We must come down nearly to our own time to

find it used by physicians. Lorry ("Tractatus de morb. cutan.," Paris, 1777, p. 388) recommends tincture of cantharides in elephantiasis græcorum, and states positively that in his time it was much used by English physicians for skin diseases.

Biett, who is reported by Cazenave ("Dict. de méd.," 2e édit., t. VI., p. 349) to have used alcoholic tincture of cantharides at the hospital of Saint Louis for more than twenty years, in a great number of diseases, obtained very good results, chiefly in certain chronic eczemas and dermatoses of the squamous form. The tincture, in the dose of 3 drops at first, and gradually increased to 20 or more, is very successful in psoriasis, and still more so in lepra vulgaris. If given with prudence and closely watched, it causes no accidents; under its influence the skin resumes vigor, the papular elevations disappear, and in a month or six weeks, and often earlier, we may obtain the complete cure of a disease which had lasted for months. It is worthy of remark that the remedy acts more speedily and effectually in women, and in young, sanguine and active persons, than in the weak. We even admit that cantharides may have a very special action upon certain forms of this disease.

The ointment of Dupuytren is intended for baldness. It is plain that in some cases the loss of hair is caused by an herpetic affection of the scalp, and for this reason a substitutive irritation with an ointment may arrest this cause by curing the affection of the skin. But when the baldness is hereditary, or due to age, or is accompanied (as usually is the case), by atrophy of the bulbs, it is too plain that no ointment can restore to the skin of the scalp its normal anatomical structure.

The physicians of India use not only cantharides, but several sorts of mylabris, as the m. cichoris, puncta, pustulata, and indica. The natives of the marshes of Pondicherry use the root of plumbago zeylanica in powder, which is said to have the advantage of not acting on the urinary organs, while ammania vesicatoria is only a vesicant of inferior power to the preceding (*Gaz. hebd.*, août, 1861).

Injurious Effects of Blisters.

The revulsive action of blisters is one of the most precious acquisitions of therapeutics, but it must not be forgotten that it is attended with dangers. The irritation of the skin may go beyond vesication; we have spoken of diphtheria of the sore; in persons of enfeebled constitution, ulceration, anthrax, furuncles, even gangrene of the exposed surface may occur; or it may become the starting-point of erysipelas. We have mentioned the irritation of the genito-urinal passages; they may become extremely intense; and the albuminuria, which is usually transient, may be prolonged and degenerate into Bright's disease (Cornil: "Des différentes espèces de néphrites," 1869).

The indications for blisters are given under "Irritant Treatment."

Mezereon.

The different species of this plant were once used as stimulants and diaphoretics, especially in diseases of the bony system, in osteocopic pains, exostoses, scrofula, dartrous affections, and chronic rheumatism. A great many authors, including Russel, Home, Swediaur, Wright, recommend the bark as of great value, especially in constitutional syphilis. It is no doubt upon the authority of these that Cazenave desired to re-introduce it in the treatment of syphilis.

It requires to be used with care, as it is capable of causing rather severe effects. We have seen a patient affected with local paralysis, which was supposed to be due to an intracranial syphilitic exostosis, who, after taking a decoction of mezereon, suffered from severe trouble of the bladder, on two distinct occasions; so that the man's regular attendant, who at first had refused to believe that the remedy acted thus, was obliged to submit to the evidence and abandon the remedy. Is this fact exceptional, or does mezereon exert in a very slight degree an irritant action upon the urinary passages analogous to that of cantharides? This question we cannot decide.

The decoction, given internally, is made with from 1 to 8 grammes (gr. 15—ʒ ii.) to the quart of water.

The bark is used as an epispastic; but it acts slowly, and this way of applying blisters can only be used where the skin is extremely fine, as behind the ears; or in the case of patients who are irritated by cantharides.

To produce vesication or rubefaction with the bark, we choose a flexible and single piece, which is to be macerated in water, or better, in vinegar; this is placed on the skin so as to be in very close contact. In twenty-four or thirty-six hours, very small vesicles are seen rising, and by continuing the application and frequently renewing it we form a superficial ulceration which may be long maintained by the same means.

Leclerc of Tours has prepared aqueous, alcoholic and ethereal extracts of mezereon bark. An epithem made with each was applied to the forearms of three patients. The ethereal extract alone produced an energetic action. A large number of small vesicles full of a turbid serum were formed on the spot covered by this epithem. A simple rubefaction was obtained by the alcoholic extract, while the watery extract produced no effect (Leclerc: "Essai sur les épispastiques," *Journal des connaissances médico-chirurgicales*, t. III., p. 92).

It hence appears that if we desire to make an ointment of mezereon, for the purpose of exciting suppuration in blisters, we should always use the ethereal extract, which should also be preferred to the bark, when we wish to excite a little inflammation on a portion of delicate skin.

Mezereon is the basis of most epispastic papers for keeping open blisters.

Nettle.

The urtica urens is ordinarily used in external medicine.

Urtication.—This term signifies the irritant effect produced upon the skin by contact with nettles. To produce it, make a little bunch of the longest stems of the u. urens, and strike several times lightly on the part of the skin you wish to irritate. The skin is almost immediately covered with large, flat, white, irregular papules, which cause an insupportable burning pain. This genuine "urticaria" disappears with the same rapidity, and the operation must be repeated in order to recall it; but the skin does not respond so readily to subsequent appeals, and the third or fourth application may have no marked effect. For this reason, countrywomen gather nettles with perfect impunity.

Urtication has been recommended for the purpose of recalling exanthemata, and, in general, all external fluxions that develop slowly or tend to disappear, and likewise in all other cases where it is important to set up an energetic fluxion to the skin.

Thus Celsus and Aretæus advise urtication in coma and paralysis ("De re medica," lib. 3, cap. 27.—"Curat. acut.," lib. 1, cap. 2). Others have used it upon the thighs to recall the menses (*Bull. de Férussac*, t. IX., p. 77). It has also been recommended in anaphrodisia.

In the epidemics of cholera which have passed through our country, a certain number of physicians, especially in the country, have used urtication in the cold stage. When the skin retains sensibility, and the algidity is not complete, some good effects have been produced; but it has been praised ridiculously, and, on the whole, it is neither better nor worse than most other irritants of the skin.

Ranunculaceæ.

Many members of this family of plants have a very powerful action on the skin. The species which compose the genera clematis, anemone, ranunculus (Linnæus), are the most active. We particularly mention ranunculus sceleratus. It has been recommended as a cataplasm, to produce resolution of swollen glands and cold abscesses.

The clematis vitalba (beggars' plant) owes its popular name to the use which beggars make of it to produce upon their limbs appearances which excite the pity of the public. This action, says Leclerc ("Essai sur les épispastiques," *Journal des connaissances médico-chirurgicales*, t. III., p. 91), is analogous to that of mustard; it is profound, yet it quite rarely raises the skin. The inflammation it causes extends to the whole depth of the skin, and beyond.

These vegetables owe their irritant properties to an acrid, volatile oil, difficult to obtain by distillation; this principle irritates the pituitary mem-

brane, excites lachrymation, and possesses a great analogy to that of some liliaceæ and cruciferæ, especially horseradish. It is dissipated by drying, so that the dried ranunculaceæ have, so to speak, no irritant property, and cattle may eat them without injury.

These plants may be used when mustard cannot be got; they are beaten to a pulp, and act with sufficient force when placed between two cloths.

Clematis is often used in Holland as a diuretic in dropsy. A physician of Liége, M. Sauveur, has used an infusion of clematis-seed in two cases of albuminuria symptomatic of Bright's disease; he states that an abundant diuresis was established, the quantity of albumen in the urine lessened from day to day, and the dropsy disappeared (*Gaz. méd.-chir. de Liége*, nov., 1864).

Euphorbiaceæ.

A rather intense vesicular inflammation of the skin is produced by some of these plants; among others, by the croton tiglium (the oil) and euphorbia lathyris (the milky juice). These two oils, when spread on the skin, produce a genuine dermatitis with pustules.

The amount to be applied varies trom 10 to 40 drops. One application will produce, after a few hours, all the signs of inflammation, painful sensibility, redness, swelling, heat; and in 24 hours vesicles are developed. The latter are usually discrete, separate, but in many places run together and may form bullæ.

The contents of the vesicles are at first transparent, and may remain so throughout, but usually grow turbid and purulent on the second day. The pustules are at first tense and shining, but soon sink and become wrinkled. Sometimes the pustule breaks and displays a superficial ulceration, limited by a strip of epidermis, and soon covered with a yellowish crust. In a week the eruption is cured, and nothing remains but a spot which has the color of ephelis.

This eruption is usually quite painful during the whole period of its development, and sometimes later, if ulcerated.

Certain secondary eruptions should be mentioned. A patient, suffering from the itching which the eruption produces, will often put his hands upon it to scratch, and will afterwards put them on his face or scrotum, and cause in those places a dermatitis which, though it does not usually cause pustules, is quite painful, particularly on the scrotum. The same thing happens to the person who makes the application, if he does not sufficiently cleanse his hands afterwards.

The volatile portion of the oil may spread the dermatitis to neighboring parts; in particular to the face, when it is rubbed on the neck.

Laryngitis.—Bronchitis.—Croton oil is used as a revulsive, most commonly to combat acute catarrhal affections of the larynx and bronchi. It

is used almost constantly to relieve a laryngitis which has little of the inflammatory element, but is accompanied by aphonia due to paresis of the vocal cords.

It is also used in chronic recurrent bronchitis and in phthisis, to relieve acute attacks of tubercle or caseous pneumonia. The attempt to relieve meningitis or enteritis has proved unsuccessful, and has been abandoned.

Dropsy in disease of the heart.—Anasarca.—The description given above of the action of croton oil was intended to apply to the healthy skin. In anasarca, produced by disease of the heart, two different conditions may exist in the skin of the lower limbs. In some cases, while the anasarca is considerable and the skin distended, the skin is thick like that of pachyderms, exempt from the anasarca, as it were. It is œdematous, and keeps the print of the finger, but is as hard as leather. If these patients are rubbed liberally with croton oil, the eruption produced will be insignificant. Red acuminated points, with a hair in the middle, will be seen here and there, forming an artificial acne; there is a little dermatitis, with some pain, but no abundant secretion.

The case is quite otherwise when the skin is smooth and transparent, and so infiltrated that it seems ready to break out at any moment. If in such a case we make an application of croton oil as before, the eruption will be extremely abundant, and a considerable number of vesicles will form, which will soon become confluent and will break almost immediately. The patient is inundated with a very large quantity of liquid, proceeding not from the secretions of the vesicles alone, but from all the openings of the ulcerations produced by the irritant. It is a genuine flux, and changes the patient's condition so rapidly that if the physician has never seen it before, it causes much uneasiness.

The first effect of this active treatment is to produce an enormous spoliation, which seems to exhaust the patient. The appearance of the limbs is not reassuring; they form a vast sore with a grayish base, resembling an immense sphacelus. But on the second day there is a change. The depletion of the circulatory system allows the patient to breathe more deeply, the heart and blood-vessels regain energy, hæmatosis is re-established, the skin becomes more clear, and the color of the face better. The alarming sore retains the appearance of an eschar for some days, but recovers much sooner than one would suppose.

We have many times employed this practice where digitalis, diuretics, and purgatives had ceased to act, and have been enabled to restore persons to life when the progressive asystole threatened a speedy death.

We only recommend that the oil shall be applied chiefly to the legs and knees, avoiding the upper parts of the thighs; for when the application has been made in the latter place, the scrotum ulcerates, leaving very troublesome sores, often very hard to cure, which make all the patient's movements painful.

Chronic rheumatism.—Ten years ago a great noise was made about

a secret process which a charalatan from Germany brought to Paris, called Baunscheidtism. It consisted simply of making punctures in the skin by an instrument which thrust out a row of needles; the punctures were covered with an irritant composed of two parts of oil of sweet almonds and one of croton oil. Thus, by inoculation, a sort of eruption was obtained resembling acne, and recalling in its intensity the eruption produced by thapsia.

This process is now performed with a cylinder covered with needle-points (a spur might answer), which is held by an axis, and is rolled over the surface of the skin; the mixture just named is afterwards applied. The treatment has some efficacy, but may advantageously be replaced by friction with essence of turpentine.

Pitch.—Turpentine.

Of Burgundy pitch and turpentine as local excitants we will speak in a subsequent chapter devoted to that subject. We give here the Poor-man's plaster:

Tar Paper.

Poor-man's Plaster (Charta picata).

℞. Rosin	300	grammes.
Purified Tar	200	"
Yellow Wax	100	"

Melt together and spread thin on paper, like a plaster.

Resin of Thapsia Garganica.

This resin, obtained by the action of boiling alcohol on the bark of the root of the plant (an umbellifera, very common in Algiers), was proposed by MM. Reboulleau and A. Bertherand in 1857. The former made a vesicating plaster of the resin, which was of a fine yellow, shining and very adhesive; it produces on the skin a rubefaction accompanied by a very intense miliary eruption analogous to that caused by the application of croton oil.

Plaster of Resin of Thapsia.

℞. Yellow wax	420	grammes	= ℥ xiii. ʒ i.
Rosin	150	"	= ℥ iv. ʒ vss.
Burgundy pitch	150	"	= ℥ iv. ʒ vss.
Boiled turpentine	150	"	= ℥ iv. ʒ vss.
Turpentine from the larch	50	"	= ℥ i. ʒ iv. gr. l.
Glycerine	50	"	= ℥ i. ʒ iv. gr. l.
White honey	50	"	= ℥ i. ʒ iv. gr. l.
Resin of thapsia	75	"	= ℥ ii. ʒ iii. gr. xv.

Melt together the first five, and strain through linen. Keep them

liquid over a very gentle fire, and add the glycerine, the honey, and the thapsia resin (it should be of the consistency of honey). When the mixture is very homogeneous, spread on strips of linen as for ordinary plasters.

The eruption produced by thapsia greatly resembles that produced by croton oil or euphorbia lathyris, but differs in the following points:

1. In its uniformity and regularity, all the pustules being alike.
2. In the large number of pustules.
3. In the rapidity with which pus appears in the vesicles.

IRRITANTS IN GENERAL.

Irritants are agents which produce an irritation at the points to which they are applied.

The science of irritant treatment includes the physiological effects of these agents, and the relation between these effects and the therapeutic indications they are called on to fulfil.

We shall divide the subject into four sections: substitutive, transpositive, spoliative, and excitative, irritant treatment.

Substitutive Treatment.

The homœopathic doctrine, considered in its general fundamental idea, certainly does not deserve the ridicule which the therapeutic applications made by the homœopaths have occasioned.

When Hahnemann uttered the principle "similia similibus curantur," he proved his position by facts taken from the practice of the most enlightened physicians. It is fully proved that the local phlegmasiæ are often cured by the direct application of irritants, which cause an analogous inflammation of a medicinal character, which takes the place of the primitive irritation.

That which was true in regard to local diseases and topical agents was certainly much less so in general diseases and remedies; but Hahnemann, dazzled by the truth of an idea which he had guessed and formulated, soon exaggerated, like all innovators, the importance of his discovery.

His disciples, as always happens, soon outran their master, and carried him away with their exaggerated ideas; German mysticism soon added its contributions, and the system gained many partisans, for there is no idea so absurd that it does not find physicians to maintain it and patients to throw themselves in the way of experiments. Homœopathy has had its run in Paris, as everywhere; there is hardly a physician but has lost some patients by it; but now that the infatuation is past, and requires no courage to enter on a combat with an enemy disarmed by ridicule and failure, let us try to discover what is of practical value, not

the dreams of old homœopathy, but in the first idea that broke from the brain of Hahnemann.

When a morbific cause is applied to a man's body, it produces effects which are necessarily related to the nature of the cause and to the state of the economy which receives the impression.

Nature of the cause.—According to Brown and Broussais, there exists but one cause of disease, the application of excitants to the body. Every cause acts simply by the greater or less excitation which it produces—excitants as the cause, excitation as the effect; this is about the sum of the pathological doctrine of these great innovators. The difference in the intensity of the cause, and in the mode of reaction of the economy, are the source of the innumerable varieties of morbid forms. The different interpretation which Brown and Broussais drew from the play of reaction caused the prodigious divergence in their therapeutical conclusions. And yet the fundamental idea of their doctrine is identical; Broussais recognized it when he took the synthetic proposition of Brown's doctrine for the text of his own teaching.

As we have said, Brown and Broussais admitted as an axiom an erroneous proposition which nothing as yet proves; and since their whole doctrine rested on this fragile foundation, they succeeded, while reasoning with much vigor and logic, in reaching the most incorrect conclusions.

That life is kept up only by stimulants, is an apparently self-evident truth; but if we reflect a moment we shall see that it is not provable.

It certainly cannot be denied that life is kept up only by modifiers; the truth of this proposition is trivial; but it has exactly the triviality which belongs to axioms, and therein lies its value. The words modifier and modification express facts which are not opinions; the words stimulant and excitation substitute an opinion for facts, and the reasoning is bad.

It is a fatal error in philosophy to attach to words only a slight importance; in leading propositions words are of the highest moment, and their sense ought to be so clear that their use in discourse should never check the comprehension of the reader.

We shall presently see the importance which belongs to the ideas of modification and modifiers, and how much better they represent facts than does excitation, the principle of Brown and Broussais.

In fact, for these two pathologists, everything lies in the quantity of the stimulus, provided that the organic state is alike in all men.

The gravity of a pneumonia, cæteris paribus, depends on the quantity of stimulus applied to the pulmonary parenchyma. With this a proportional extent of local lesion and of reaction exactly corresponds. And so in the pleura, pericardium, peritoneum, liver, brain, uterus, etc.

These facts are incontestable; it is their evident truth that leads astray the illustrious men with whom we differ. When it is shown that external and physical agencies, which are plainly the same for all, bring to

pass different results, they invoke the difference in organisms; and in this they are correct.

Herein are included a large part of the diseases which in strictness are embraced within their system.

But they were soon shaken by the pathologists, who devoted themselves to the study of special diseases; Bretonneau, in particular, in calling attention to special lesions of the mucous membrane—e. g., diphtheria and dothinenteritis—inflicted upon the doctrines of Edinburgh and the Val-de-Grâce a blow the gravity of which Broussais vainly attempted to deny. Bretonneau agrees with us in thinking that differences in diseases are due much more to difference in their causes than to variety of organization.

In our view, it is less the quantity of action of the morbific cause, than the quality of the modifier, that determines the nature of a disease; as it is not the quantity but the quality of a seed that determines the nature of a crop.

Quantity gives for a result only more or less; quality gives species.

There is to-day no pathologist, however obstinately he may cling to a dichotomic doctrine, that does not admit certain local or general diseases, in which are observed certain forms so constant and invariable that one is forced to admit the importance of the quality of the modifier. In their view these diseases are the minority; in ours, they are the more common.

And first, all the contagious diseases, without exception, are special diseases. Of these we may justly say that they are sown from seed, and necessarily retain some of the quality of a generative agent. And contagious diseases are much more frequent than is commonly supposed.

If we exclude the idea of contagion, and class diseases by their local and general symptoms only, we shall at once find the class of special diseases to be so broad as to fill the greater part of nosology.

Taking, by way of example, those modifiers whose effects are the easiest to follow, we see that the chemical agents, when applied to the body, produce each its special action. Thus, the chlorides of gold, arsenic, zinc and antimony; fire; potassa, soda, lime; nitric, sulphuric, muriatic and fluoric acids; the salts of silver, copper, mercury, etc., act upon the skin so differently, that with a little practice one may recognize the agent by its physical or chemical action upon the tissues, and by the local reaction which succeeds its application.

Here, evidently, we cannot argue from the quantity of action, for experience shows that we can never do with nitrate of silver what we can with butter of antimony, whatever be the doses. It matters little that this is due to the different chemical qualities and modes of combining with the tissues, provided there be a difference, and a constant difference.

If now we examine the poisons, we see each acting in its own way, so that the slightest examination almost always enables us to distinguish the nature of the poison. The least skilled specialist can distinguish the

poisonous effects of opium from those of stramonium, veratria and strychnia; those of lead form those of mercury, copper and arsenic: he readily notes the difference in the effects of the poison of the rattlesnake, the viper, the scorpion, the bee, the tarantula, the mad dog, the animal affected with malignant pustule. Each cause has a special effect, characterized by a particular form, reproduced in each case like the specific character of a series of individuals in a species.

What can we add of the poison of small-pox, vaccinia, scarlatina, measles, syphilis, that has not been told at all times and places?

That which we see in men, we see in animals—nay, in plants, whose organization is so inferior; in their pathological disorders the plants bear a powerful testimony to the influence which the nature of a cause has on the form of a disease. The insects which sting the leaves or twigs produce at the point of contact morbid excrescences, which unmistakably recall the agent; the form of gall that follows the prick of a given insect is so constant that the skilled naturalist can always infer the nature of the contained larva from the form, color and volume of the swelling.

These are not idle questions, but will establish the fact of specificity of duration, a great point in substitutive treatment.

In all these instances it would be flagrantly absurd to attribute the effects solely to the quantity, and not to the quality of the cause. Whatever the quantity of variolous virus employed, it is as impossible to provoke with it the symptoms of hydrophobia, as to make with escharotics an eschar that shall behave like malignant pustule.

If it is absurd to deny to the quality of the cause an immense share in the form of the effect, it is almost as absurd to exclude quantity as a causal element. The matter of more or less is a very important portion of a cause, as regards the intensity of effect—but not as regards the intimate nature of the effect.

Hitherto we have descended from cause to effect. The cause, being well known, well appreciated, in the time of its application to the body, if not in its intimate nature, is easily followed in the play of reaction which it causes in the system, and the special form of the secondary phenomena is easily followed. If all causes were as easy to grasp, there would be no difficulty, and specialty would be easily proved in almost all diseases; but in a great many cases the cause is unknown, the effect alone is before us, and we have to ascend from a known effect to an unknown cause.

The specialty of a disease is as well proved by the invariability of its forms, independently of the causes which produce it, as if the effect and the cause were both known.

The causes of most of the functional troubles of the bowels are wholly unknown to us; but the lesions connected with those functional troubles are so invariable in form that we accept their specific nature at once. Between Asiatic cholera, dysentery, and dothinenteritis, the differences are so marked and the symptoms accompanying them are so positive, that

the least skilled can distinguish them from one another; and the possibility of such distinction implies the idea of specialty, for no distinction is possible unless there exist specific characters, and the establishing of these characters at once proves specificity.

In the three diseases of which we have just spoken, the nature of the affection is certainly not inferred from the phenomenal quantity, that is, the intensity of each symptom, but by the quality, that is, the special form of certain phenomena, independently of their intensity.

We can never turn a dothinenteritis into Asiatic cholera, nor a dysentery into cholera morbus, whatever be the severity of the diseases. Each will preserve its distinct features and its specific characteristics. It is philosophical to infer constancy of causes from constancy of effects. Nor is it more logical to presume an identical cause for cholera and yellow fever, than it is to ascribe small-pox and scarlet fever to the action of the same virus.

The followers of Brown and Broussais, after a long struggle with the arguments which were ruining their dichotomic doctrine, were at last forced to recognize special diseases; and as if their system were not destroyed by this admission, they made another attempt to reconcile the doctrine of specialty with their own narrow theories.

What does it matter to Brown whether small-pox is a special disease or not? It is nothing to him; he attends solely to the fact that it is sthenic or asthenic, and requires stimulating or debilitating treatment.

As for Broussais, what does he care that cholera differs from dothinenteritis in its form? It is after all only an irritation of the digestive tube which calls forth different sympathies. Irritation is the common and culminating phenomenon; it is the only serious cause, it rules all, and from it spring all therapeutic indications. This is the position of Broussais; we have not attenuated it; we have left it in its full strength, but it seems to us none the less weak.

Doubtless, most of the modifying agents, applied to the human body, cause a common local reaction which has been by common consent termed inflammation or irritation. The whole question is reduced to this: whether this phenomenon has really the importance which has been assigned to it. No doubt, inflammation is a common character in malignant pustule and furuncle, variola and impetigo, syphilitic chancre and preputial herpes, acute laryngitis and croup, dothinenteritis and gastric oppression, catarrhal and blennorrhagic ophthalmia, phagedænic dartre and varus sebaceus, as there are characteristics shared in common by dulcamara and datura stramonium, chelidonium and poppy, eglantine and cherry-laurel, since they belong to the same natural families; but what physician, what naturalist, would be so deluded as to attach a merely secondary importance to their specific traits?

Listen to M. Bretonneau: "The obstinacy of a physician," says this excellent practitioner, "who persists in seeing in bronchial catarrh and pellicular angina only two unimportant shades of one affection, is equal

to that of a naturalist who should maintain that a viper is only a variety of adder, and, offering in proof of this view the similarity of the mode of circulation and of the generic marks only, should regard the scales and the plates which cover the head, and the absence or presence of venom-fangs, as unimportant differences. But what can one say of the enemy of distinctions, when, to his prejudiced eye, a viper and a rattlesnake are only exaggerated adders? What ground can one take? We can insist on the difference of the effects of the bites, and, while waiting for truth to shine forth, can make haste, if a poisoned wound has been received, to remove the cause of a great disease by cutting out a little piece of living tissue" (Bretonneau: "Notes inédites sur les phlegmasies spéciales").

The physiologism of Brown and Broussais is not so remote from us as might at first be thought; if it has changed its form and is disguised under the name of variation in tension of vessels, of excitation and paralysis of the vaso-motors, it is still the strictum and laxum of Themison; formerly it was a property common to all our organs, at the beginning of the century it was incarnated in the tissues, and at present it is only considered in the vaso-motors. It is still the theory of Themison, dressed in the fashion of the day.

We intentionally lay weight on the question of the specific nature of diseases, because this question rules in pathology, and we could not make substitutive medicine understood unless we had previously established the great pathological principle, that "a special modification corresponds to the action of each modifier."

At the beginning of the century this law was called specificity; it is now named determinism.

All the irritants determine an irritation of a severity and a gravity which, considering the lesion as local or as general, are dependent upon their own essential nature; that is, if we leave out constitutional peculiarities. The attentive pathologist may calculate to a certain point the reach of the irritant, and when he cannot grasp the cause, he may nevertheless, by experience and the application of medical statistics, estimate the probable duration or the gravity of a phlegmasia. He sees that some have a necessary and fated course; that they arise, grow and end at a determined time; that others, uncertain in duration, in some cases have an ephemeral duration, in others are irresistibly prolonged to the end of life, and in others appear and disappear without any regularity in their progress.

A truly learned physician, therefore, knows pretty well the probable duration and the natural course of a disease. This, the most important notion for the therapeutist, without which he cannot philosophically make the least experiment, is most neglected in clinical study. It is the element which is essentially lacking in all homœopathic physicians.

The progress and duration of a phlegmasia being known, if we could place in contact with the inflamed tissue a modifying agent, itself an irritant, which should change the mode of irritation and shorten the dura-

tion of the disease, should we not be rendering a great service to therapeutics by this substitution?

Now, is this a fair statement? Evidently it is. The conjunctiva is inflamed; a collyrium of sublimate, nitrate of silver, calomel, red precipitate, irritating the inflamed part for a moment, cures the inflammation.

The fact being established, let us study its laws.

And first, although substitution can be practised mediately, that is, through the absorbents, upon tissues with which the irritants are not in direct contact, we restrict our attention to direct substitution, that is, that which is exercised by the irritants applied directly to the irritated tissues.

The first thing to be established is the gravity and the natural course of the disease. Next, the influence of the modifying agent must be ascertained; for it is above all necessary that the substituted disease be not worse than the one replaced. For example: agents which destroy the tissues by chemical or physical action are wonderfully adapted to disperse the lesions of these tissues; but destroying is not curing, and if the physician is sometimes forced to such measures, it is only when the local disease is so grave and incurable that destruction is indispensable.

But the therapeutic effect of the agent can hardly be anticipated, and experience alone can inform us how the vital properties react against the irritant cause. There seems to be a notable difference between quick-lime which makes an eschar in a few minutes, and the more slowly acting butter of antimony; one would be tempted to think that the action of lime would be more painful than that of the chloride, but experience shows the contrary; and in many local inflammations which are usually called spontaneous, and which differ from others only in conditions which are wholly independent of the cause, this difficulty in judging reappears. At the beginning of two anginas, in one of which there is a slight local inflammation with a membranous exudation and hardly any fever, and in the other the most energetic symptoms of inflammation and general reaction, it seems natural to think the one most severe which strikes hardest; and yet, while the latter does hardly more than to occasion a few days' discomfort, the former almost always kills by the septic and destructive nature of its principle.

The gravity of an irritation is judged neither from the nature of the pain, nor the order of appearance of the symptoms, nor their rapidity of development. If a concentrated solution of tartar emetic is dropped into the eye, only a slight stinging is felt; but if a grain of snuff falls in, the most violent irritation ensues, lasting for only a few minutes, while in the other case the eye is slowly injected, becomes inflamed, and the severest ophthalmia soon appears, often followed by loss of the eye.

The severity and the course of therapeutical inflammations, if we may so speak, are known only by experience, as in the case of pathological inflammations.

Therefore, before using substitutive treatment, we ought to know the range of our weapons.

Some of the irritants have a very short range; they produce very transient effects; such are the nitrate of silver, sulphate of zinc, nitrate of mercury, calomel, and the alkaline chlorides; of others the effects are much less fleeting, as cantharides, tartarized antimony, arsenic, the strong caustics, mustard, the euphorbiaceæ, the ranunculaceæ, the colchicaceæ.

As it is always necessary to proportion the intensity of the action of the substitutive agent to the inflammation, it would be absurd to attack superficial lesions with agents of the second series, which are suitable for grave, deep, or chronic lesions of tissue. Thus, malignant pustule and the variolous pustule are destroyed by a caustic; and superficial carcinoma of the skin, which is aggravated by superficial irritation, is destroyed by caustics that take off the whole thickness of the derma, or by irritants, like arsenic, which have a deep and prolonged action.

Two mistakes must be avoided in proportioning the substitutive action to the exciting irritation; we must neither do too much nor too little.

It generally does little harm to do too little; one may even, by following this prudent path, attain the same end, if the action is kept up and repeated. Suppose a blennorrhagia of the urethra, which we wish to cure with injections of nitrate of silver. We begin with a weak solution; 1 part in 3,000 of distilled water produces a slight therapeutical irritation which will not control the syphilitic phlegmasia, but will substitute itself for a part of it, so that, to use an inexact representation, we have a blennorrhagic irritation represented by 10, and a substitutive represented by 2. The substitutive not being proportionate to the irritation, the latter remains 8; but if we prolong the contact of the irritant solution, we may make up for its weakness by time.

This method is the more rational, as it is impossible to know beforehand the sensibility of the tissues, and as it is better to have to increase the irritation than to lessen it, when it has rashly been made excessive.

We said that each agent had its own range. The duration of action varies from a few hours to some days, according to the intimate nature of the modifier and the dose used.

The morbid irritation, as pre-existent, and as having deeply modified the tissue by simple duration, has acquired a sort of right of domicile, and a great tendency to reproduce itself. If the substitute acts only six, twelve, or twenty-four hours, it may replace the inflammation for that period; but if it be left off at once, the primitive condition returns. In order to produce effective substitution, the action must be renewed before the effect of the former application is entirely gone,

Thus, when dysentery is treated with injections containing nitrate of silver or neutral purgative salts, the pain, the colic and the bloody flow are lessened by the first injections; but they appear again in a week or

ten days; the rule here is, not to wait till the return of the dysenteric symptoms, but to renew the injections so often as to keep the patient continually under their action.

Assuming, as we have done hitherto, that all the patients are in identical conditions, and that no individual peculiarities come in play, it is evident that the substitutive irritation will be proportionate to the dose of the agent. But it is necessary to attend to what Brown called the exhaustion of incitability, in order not to use the remedy in vain.

According to Brown, each organic element has assigned to it, as to the entire system, a fundamental property—incitability. Stimulants develop incitation; but in this process the capacity for incitation, or incitability, becomes exhausted. It follows that the physician's part ought to be to restore incitability by rest, food, etc., that the same stimulant may always produce the same incitation; or else to increase the action of the incitant, in order that the incitation may remain the same, though incitability is lowered. In fact, this amounts to saying that the tissues and the system get accustomed to the various stimulants, and consequently are no longer excited by the agents which formerly so acted; that in consequence, in order to obtain the same result daily, the power of the excitant must be increased just in proportion to the diminution of organic susceptibility. The consequence of these principles is, that the dose of the substitutive agent must be gradually increased, not at an equal rate for all patients and cases, but in a proportion to be determined by experimental study of the patient's irritability.

From this great pathological law of Brown's there springs another essential application of substitution in acute or chronic diseases.

Doubtless the habit of inflammation in a tissue renders the tissue more apt to receive the same inflammation, but less apt to take foreign impressions. So, other things being equal, a more energetic irritant is required in a chronic than in an acute disease, and the importance of this rule becomes more evident when we think that, in addition to the loss of incitability, a necessary consequence of chronicity, we have also to strive against a prolonged vicious direction of the vital properties of the part, and against a deeply rooted disease; while in acute inflammations the substitution not only costs less, but does not require to be kept up so long.

Our remark upon the necessity of sustaining an impression, to prevent the disease from regaining its hold, leads to another precept which is, in a sense, the corollary of the former, namely, that we must not only repeat the action, but prolong it so as to cause the tissue to lose entirely the former habit of inflammation; the action of irritants must sometimes be kept up for weeks.

We laid down a rule, never to remove an ordinary inflammation at once; but some bolder physicians, after making a few preliminary trials to ascertain the susceptibility, double, treble, decuple the violence of the irritant, replacing the inflammation forcibly by a new therapeutic inflam-

mation. This is not always very prudent; but, while we are disposed to object to it in common cases, we desire to make it a principle in local diseases, the severity of which may in a few hours compromise life or the health of an organ. We ought to cauterize malignant pustule and its surroundings as quickly as possible, and to apply lapis infernalis to the conjunctiva when attacked by blennorrhagia.

Substitutive irritation must not be confounded with morbid inflammation, nor *vice versa*. It is rather worse to obtain too little than too much effect. If the inflammation is kept up by persistence in the remedy, it is sufficient, in order to cure, to stop all treatment; while, if the primary inflammation were still in existence, and were allowed to acquire force by a momentary suspension of treatment, the latter would have to be recommended.

Let us seek to establish a criterion, whereby we may decide whether the remaining inflammation belongs to the disease or the remedy.

When an irritant is applied to an inflamed tissue, the symptoms of inflammation are usually either increased at once, or experience a more or less considerable diminution.

If experience shows that the morbid secretion, the pain, or itching, are lessened under the influence of the irritant, the return of such symptoms will mark the return of the inflammation and the cessation of substitutive action. If, on the contrary, the substitute causes a marked increase in the pain, the secretion, the itching, etc., then a diminution in these symptoms will indicate the necessity of recurring to the modifying agent.

The former point is very easy to decide; but the latter is so hard that we think it impossible to be guided except by the long-tried results of experience.

In the majority of cases we do not try to remove the inflammation at a blow, and we cannot suppose the substitution to be complete; if, therefore, after twenty-four, forty-eight, or seventy-two hours, we find a decided diminution of the primary symptoms, we may infer that the remedy is acting, and that we may resume it; and, although the inflammatory symptoms which appear immediately under the influence of the agent are indistinguishable from those of pathological irritation, we shall have no other guide than the results of experience and analogy, which may be relied on with more certainty than rules which are subject to too many exceptions.

The Brownian principle which we stated, or, if preferred, the study of the influence of habit, lead to other therapeutical consequences. We have seen that the habitual use of stimulants lessens the incitability of a part. It follows that the habitual application of stimulants is a useful prophylactic against local irritation. This is well known to women who employ for the cure or prevention of acne rosacea, irritant lotions containing sublimate, or simply very hot water. Do we not see the habit of warm injections extinguish the sensibility, the contractility, and the secreting power of the intestine, just as the habitual use of highly-seasoned food

and gastric stimulants, far from producing gastritis, leaves the mucous membrane of the stomach in a state of organic insensibility which paralyzes all its functions. This truth was admirably shown by Brown, but ill appreciated by Broussais. In this way, workmen who are constantly exposed to a strong heat, far from having complexions like the people of the north, are remarkable for extreme pallor, as cooks, bakers, glass-blowers, charcoal-burners, etc., and the inhabitants of tropical climates. Those who specially treat disease of the skin know the immense value of the application of caloric, not less as a preventive than as a curative.

Hitherto we have paid little attention to the cause of the phlegmasia, and have treated it as if it were always of internal origin. Nor have we mentioned the state of the system. We have made the omission purposely, and certainly no one will be led to think that we neglect the importance of external causes. In internal inflammations the cure of the cause is sometimes the principal point; in other circumstances, this cause may be neglected without inconvenience. In most of the cutaneous syphilidæ the internal treatment is almost always sufficient, and topical treatment is almost superfluous; while in almost all dartres the internal treatment is secondary, and the direct agents hold the first place.

Admitting that the dartrous inflammation proceeded from an internal cause, it would not follow that we ought to confine our attention to that cause, for the cause may have ceased to act, while the local disease continues, exactly as the irritation may last long after the application of an external irritant agent.

The choice of the agent ought to be influenced in some degree by the internal cause, however inactive it may have become. For instance, nitrate of mercury must be preferred to nitrate of silver in syphilitic inflammation; the preparations of iodine to the salts of copper in scrofulous dartres, because each organic molecule is a sort of microcosm representing the general condition.

The applications of substitutive local treatment are innumerable. Most of the acute and chronic diseases of the skin, considered as local affections, are under the jurisdiction of this great method; and the same is true of diseases of the mucous membranes.

The treatment of traumatic erysipelas by ointment of nitrate of silver, of acute eczema by vapor-baths, sublimate, or washes of phagedænic water; the use of mercurial plasters upon the face in small-pox; the washes and ointments, alkaline, sulphurous or mercurial, in most herpetic maladies; the use of very warm lotions, and vapor-douches at a very high temperature, in many chronic affections of the skin, are all applications of substitutive treatment.

In the treatment of acute and chronic diseases of the mucous membrane, these applications are still more frequent.

In ophthalmia, and diseases of the nasal mucous membrane, nitrate of silver, sulphate of copper, sulphate of zinc, calomel, red precipitate, and very hot water, are used.

In stomatitis, and the severest and most obstinate angina, muriatic and nitric acids, dry chloride of lime, calomel, alum, sulphate of copper, nitrate of silver.

In croup and whooping-cough, cauterization of the upper part of the larynx; in chronic affections of the larynx and bronchi, inhalation of vapors of arsenic, muriatic acid, mercury, iodine.

In acute or chronic colitis, calomel, injections of nitrate of silver, of irritant salts, of sulphuret of potassium; the various injections which are thrown into the urethral canal and the bladder; perhaps the action of ipecac, of emetics, of certain purgatives in gastro-intestinal inflammation, and of the balsams in mucous flux.

This important method of treatment can only be summarily stated here; its applications in detail are given under the individual remedies.

Transpositive Irritant Treatment.

When two physiological or pathological acts of a certain value are performed at one time, the stronger one weakens the other. This is the interpretation of the celebrated aphorism of Hippocrates: "Duobus laboribus simul obortis, non eodem loco, vehementior obscurat alterum." On this principle rests transpositive treatment. The problem is as follows: "Given a severe lesion, to produce artificially, in another place, a more energetic and less dangerous lesion, in order to attenuate the former."

The possibility of transposition is subordinate to circumstances which it is very important to state here, relative to the nature, seat, and extent of the disease.

Relative to the nature of the disease.—Some local lesions hardly change the texture of the organs, and are so mobile that they change their seat at the slightest perturbation. Among these are included neuralgias which have not involved inflammation of the nerve, rheumatism at its outset, the congestions and certain inflammations of the skin, such as urticaria, roseola, measles, etc.

Other lesions are marked by a very great adhesion to the organs, so great that sometimes no treatment overcomes it. Such are the eruptions of small-pox, most of the parenchymatous inflammations and organic degenerations.

Whatever attempt we may make with revulsives to arrest the progress of a pneumonia, a hepatitis, a pustular eruption of the skin or mucous membranes, we shall never succeed; the disease takes its course, unless other remedies are used. But, in the lighter affections of which we just spoke, an irritation applied to the skin or a mucous membrane often suffices to transpose the irritation.

Relative to the seat of the disease.—The acute phlegmasiæ of the mucous membranes are more generally rheumatoid or catarrhal—that

is, the irritation is transient, superficial, not tenacious; while in the parenchymata it is more obstinate and profound. This is doubtless due to the facility with which irritant secretions unload the tissue, while in the parenchyma the secretions are retained to become the cause of a fresh irritation. Whatever may be the explanation, experience shows that the transposition is easily made from a mucous membrane to the skin or another mucous membrane. Catarrhal angina often yields with extraordinary rapidity to an emetic, a purge, a simple sinapism; and so with certain forms of bronchitis, coryza, gastritis, enteritis, and colitis; in this case the irritation of the mucous membrane is probably rheumatismal in character. One equally advantageous result does not follow, even in slight phlegmasiæ of the parenchyma. The transposition is not so easy in parenchymatous affections, except when the irritation has produced only congestion, or when the acute symptoms are already dissipated.

Relative to the age of the patient.—Not all the phlegmasiæ have an invincible tendency to suppuration like the variolous inflammation of the skin. Some can be checked without very great difficulty, and have not a predetermined course. We do not doubt that in many cases pleurisy begins and is aborted quite unknown to the physician; that it is the same in pneumonia and inflammation of the tonsils. In this case nothing but a simple congestion exists, due to a local irritation or a general cause. There is as yet no such local lesion as to cause any great sympathetic trouble; a slight diarrhœa, an epistaxis, an abundant sweat, a foot-bath, conjure a disease which would probably have been severe if the transpositive irritation had not been developed at a remote part.

But if an irritation causes something more than simple congestion, and a true inflammatory fluxion exists, the irritants can seldom displace the inflammation; they usually aggravate it unless the revulsives are very powerful or the inflammation very light. Velpeau caused diffused phlegmons of the leg to abort by covering it almost entirely with a blister; and it was formerly the custom with certain physicians to cover the chest with an enormous blister in all periods of pleurisy and pneumonia, whereby they often aborted the inflammation. This is also the practice of M. Gendrin, who thinks highly of it. But it is a practice which we should not dare to apply, and which we should never advise unless a well established experience showed its value.

When the acute stage of inflammation is past, if the fluxion persists, and the other inflammatory symptoms do not disappear, we may infer that the irritation no longer exists, and may then employ revulsives to advantage.

As the occasion offers, we owe it to our readers to explain ourselves clearly upon the preceding paradoxical statement.

The physiological school presume the inflammation to exist until all the inflammatory symptoms are past; we believe that there may be little or no irritation at a period when certain inflammatory symptoms are at their height.

We do not think that the primary results of irritation have been suffi-

ciently distinguished from the secondary; the immediate consequences are increased vascularity (sanguineous congestion), the consequent swelling, pain and heat. But what would become of these symptoms if the irritation were to cease at once? Swelling and pain would remain, while the active fluxion and the heat would disappear almost immediately. Swelling would remain, because morbid products would be effused in the parenchymatous framework or the cellular tissue, and pain, because of the mechanical distention; just as when an irritation of the pleura or peritoneum wholly ceases, we may yet find abundant morbid products in the serous cavity, though the cause for them has long disappeared. Thus, two of the most capital phenomena of inflammation, swelling and pain, may exist in a high degree without irritation.

We suppose a sudden disappearance of irritation. Though this hypothesis may sometimes be realized, it is quite rare; irritation usually goes gradually, and the inflammatory phenomena afterwards depart readily. But a slight irritation may inhere in the part, and become a constant cause of afflux of fluids, and of other symptoms of chronic inflammation; in this case transpositive revulsion must be long continued, until the part has lost the habit of suffering.

Thus, transpositive medicine is indicated in the beginning of phlegmasias when only congestion and a moderate inflammation are present; it is usually prescribed in the height of the attack, and is reapplied when there is reason to suppose that the inflammation has become less intense, even when the swelling or effusion are not diminished.

Relative to the extent of the disease.—If the morbid state were one, transposition would always be easy, in inverse ratio to the extent of the disease; it may be stated as a principle that this is the case when we have only similar lesions to deal with; but the extent is a less important thing to consider than the nature and duration.

A catarrh covering an immense surface of mucous membrane may be transposed with ease, but the most energetic revulsion is powerless over a little ulceration or the most simple dartre. Before employing the revulsive, we must know by experience what inflammations can be transposed; after this, we must proportion the extent of the application to the extent of the inflammation. The neglect of this principle is the reason why revulsion has fallen into discredit.

In suffocative bronchitis a small blister is put to the leg or sternum, and if relief is not immediate, the weakness of the remedy is blamed, instead of the unskilfulness of the physician. How can a bronchial phlegmasia, occupying perhaps some square metres of surface, be drawn away by a blister of some centimetres' surface?—one may as well expect a severe congestion of the chest to be relieved by the letting of a few grammes of blood. We must do what Velpeau did so successfully. He knew that the treatment must be proportioned to the intensity and the extent of the inflammation, and we have seen him arrest deep phlegmons which threatened frightful results, by blisters which covered an entire limb. Thus is

explained the success of M. Gendrin, who does not shrink from covering one whole side of the chest with an enormous blister at the beginning and the height of a pleurisy or pneumonia.

The want of extension, in transpositive inflammation, is made good by the intensity of the action. We need not despair of deriving a capillary bronchitis, though it be impossible to blister a surface as large as the outspread bronchi, for we may by cantharides inflame the skin to a great depth and thus make intensity compensate for extension.

Relative to the nature of the disease.—It is impossible to transfer a phlegmonous inflammation to another point, and the same is true of certain specific inflammations. We may try in vain to drive away a syphilitic chancre, or a diphtheritic angina with a blister. Dartres in the adult, and the rashes called gourmes [crusta lactea] in children, are in the same case. Blisters and issues are a standard remedy in gourmes and dartres; it is most important to study their influence upon these affections.

Let us recall certain facts.

An irritant application made to the skin often causes a general phlegmasia of that organ; a Burgundy pitch plaster, having caused the local development of a great number of vesicles, sometimes occasions a general eczema, at first acute, which may afterwards become chronic. The application of croton oil or mercurial ointment may, in certain cases, produce the same accidents.

But few years pass in a hospital with female patients, without an explosion of eczema due to a badly dressed blister. In 1840 we had a female patient in the Hôpital Necker to whose thigh we ordered the application of a flying-blister to cure a rheumatism; it was dressed with gummy diachylon plaster. A few days later there appeared around the sore a vesicular eruption which soon invaded the whole surface of the body, causing high fever; this condition became gradually quieted, but was replaced by a pemphigus which lasted some months and required the long-continued use of sublimate baths. We lately applied to an old woman's temples two ammoniacal blisters for temporo-facial neuralgia; they were dressed with diachylon, and in a few days an eczema appeared on the forehead, and soon the face, neck, and arms were invaded, and the accidents were not calmed without great difficulty.

This singular tendency to contract cutaneous phlegmasias, very rare in men, but a little less so in women, is common in children. How often have we seen, both in and out of hospitals, an acute, simple, or impetiginous eczema attack a poor child after the application of a flying-blister to relieve pneumonia? The affection is mostly chronic; and, considering that the children had previously no cutaneous troubles, we must admit that the blister was, if not the full and radical cause, at least the occasional cause of the manifestation of the disease.

We may then state formally, that the blister often gives rise to "gourmes." Hence, as a preventive of such rashes, it often fails, and even frustrates its own end.

If we are accustomed to young children, we may be able to guess beforehand whether the skin will become widely inflamed after the application of a blister or any other agent capable of producing active and persistent local phlegmasia. Such a prediction may be erroneous, but it enables the practitioner to be on his guard.

We must not use blisters as a preventive of gourmes upon blond or red-haired children, with a very fine white skin and very red cheeks, nor upon those who chafe and suppurate when not strictly cared for, nor those whose parents are dartrous. We must not leave a blister upon those whose skin becomes irritated around the sore.

We have seen in our wards at the Hôpital Necker a young child which had had a slight lichen for several months and limited to a few points of the skin; a physician ordered a permanent blister, and in a few days the arm to which the exutory was applied was covered with an eczematous eruption, which soon invaded the entire body.

We have seen many children affected with gourmes; in accordance with routine and theories, we have applied permanent vesicatories; we have often had to repent and very rarely to be pleased with the treatment.

In general, blisters must be forbidden in such cases. But they are not forbidden in the cases we are about to specify.

We forbid them when the rash is cutaneous.

We usually advise them when the mucous membranes are affected.

We forbid in the former case, because experience shows that if the rash is on the skin, the blister makes simply one point more, without any benefit as regards the other points.

We advise it in the second, because experience shows us that a cutaneous trouble behind the ears, or on the scalp, very often alternates with an ophthalmia or a chronic eczema of the nasal fossæ, as if there were an incompatibility between them. In this case the application of a blister to the arm is commonly useful, though sometimes the disease remains obstinately in its old seat and refuses to take the new road. In this case we may give up the permanent blister, but not hesitate to call the fluxion to the point where it most readily and most beneficially places itself.

But if the blister is useful in alternative rashes (to use a rather incorrect expression), it is no longer so when the rash which invades the mucous membrane is propagated from the skin, instead of being a compensation for it.—We have often seen an impetiginous eczema gradually invade the forehead, the eyelids, the conjunctiva, the rest of the face, and penetrate within the nose; this we call a propagation. Here the blister does not succeed. But when the ophthalmia takes the place of eczema of the skin, which again takes the upper hand when the ophthalmia ceases, we have alternation, compensation in some sense; in this case the blister is commonly useful.

But if useful in those seesaw rashes, the blister is imperatively de-

manded in bronchitis, enteritis, and pulmonary or intestinal catarrh, diseases which, alternating with skin-rashes, are truly the manifestation of the same diathesis—which a true pathologist should never forget.

Mode of action of transpositant agents.—It would greatly embarrass us to have to say by what internal paths the revulsives act; the explanations of pathologists have not made the question clear, and we freely confess that we have vainly sought the explanation. The phenomenon occurs spontaneously during diseases, usually at the beginning or in the decline, rarely at their height. This may be proved, but is as inexplicable as most other intimate organic acts.

If in the course of one phlegmasia another is spontaneously developed, while the former disappears, this is considered by the physiological school a transpositive revulsion; for revulsion and metastasis are confounded by Broussais. But this pathologist has a sophism here, which relates to the order of appearance of phenomena. Take, for example, the parotids.

We know that the inflammation of this region sometimes removes to the testicle or the mammary gland. If the inflammation in the testis began while the parotidean fluxion was at its height, and if the latter did not begin to diminish until the former attained a certain point, we might well think that here was a case of revulsion. But remark, that the disappearance, nearly or quite complete, of the swelling of the parotids, precedes the pain and swelling of the testis. How can this be explained but by something wholly different from revulsion? and how can we help seeing that the pathologists were right in separating revulsion and metastasis? We easily admit that when the metastasis is completed the new inflammation may exercise a transpositive revulsion upon another phlegmasia, or even on the remnant of inflammation which lingers in the organ first attacked; but we must confess that the metastasis is the first phenomenon, the metastatic inflammation the second, and the transpositive revulsion the effect of the latter.

Leaving out the much debated question of metastasis, let us suppose that the spontaneous phlegmasia which acts as a revulsive antedates the transposition.

It is necessary next to attend to what we said above, to wit: that the inflammatory fluxion may persist after all irritation has ceased; in this case the slightest irritation will easily act as a revellent, in a condition commonly supposed to be an active inflammation, but which we shall not explain any better.

From the point of view of the physiological school, and admitting that the activity of revulsion is always in proportion to the amount of irritation, it will be asked how an irritation can go through all its stages, from the embryo through germination, and up to a point of development at which it preponderates over others, when all the time a powerful phlegmasia exists, which ought easily to practise revulsion upon it? If it be a principle that a stronger irritation produces revulsion upon a weaker,

an established phlegmasia would never suffer another to settle in the system.

But we see several phlegmasiæ marching side by side, each keeping its own course, and modifying one another but little, except in some symptoms. Among morbific causes there are some which produce disease independently of any interior circumstance. We may see small-pox and dothinenteritis, small-pox and vaccinia, and (in Bretonneau's celebrated instance) small-pox, dothinenteritis and dysentery, each with its specific form and character. We see that in this case revulsion acts only upon the inflammatory fluxion, not on the disease, which will keep on its way at all events.

The specialty of the causes of inflammations will easily explain that which the theories of the Val-de-Grâce left unexplained, to wit, that a disease in which irritation plays at first only a very secondary part may develop in the shadow of a grave phlegmasia, and may at last exceed the former in the severity of its inflammation, and may exercise a transpositive effect in diminishing it. We are led to believe that spontaneous transpositive inflammations are produced by specific causes, often inappreciable, set in operation by the primitive disease; and this is very probably the case with most of the spontaneous revulsive phlegmasiæ.

But a number of spontaneous phlegmasiæ, of identical causation, will not always act as mutual revulsives. In small-pox the inflammation of the skin of the arm, however acute and intense it may be, will never have a revulsive effect on that of the leg, for the variolous poison is one cause with a multiple effect. If we pass from a cause with acute effects to one with chronic effects, we find that multiple syphilitic phlegmasiæ of the gland, cervix uteri, the bones, pharynx, larynx, skin, do not act as mutual revulsives.

This is true as regards syphilis and small-pox; but the common symptoms of all local phlegmasiæ, namely, the sanguineous fluxion, do act revulsively upon one another to some extent. For example, swelling of the hands and feet in variolæ does make that of the face disappear, as the appearance of the eruption puts an end to the prodromal symptoms.

Duration of the transpositive revulsion.—The revulsion is divided into mediate and immediate; the immediate is rapidly ascertained, often in a few minutes. A mustard foot-bath relieves a headache or pain in the throat at once; a sinapism relieves a superficial rheumatic pain at once. A large ammoniacal blister suddenly dissipates the orthopnœa of bronchial catarrh. These results are so frequent as to have put revulsives in great and deserved honor. And when less immediate, the results may still be remarkably prompt. Improvement often occurs in less than twenty-four hours, in acute catarrh after a purgative, in catarrhal angina after an emetic, and in pleurisy or pericarditis after the application of a very large blister.

This treatment shows its value at once; it is important to know this,

for the patient's condition is commonly aggravated by persistence in painful revulsives, if after twelve or twenty-four hours they produce no good result. They then excite instead of transposing, a mode of action which we will study in one of the following chapters.

The immediate revulsion is only applicable in acute disease. Its action is essentially rapid. We have given the conditions under which it is to be used in acute disease.

Slow revulsion applies to chronic disease; but its action is always mixed. As an irritant of the skin it doubtless causes some fluxion, but its action is far more by spoliation of the elements of the blood and derivative spoliation.

In the next chapter we shall study spoliative treatment by itself; we shall here regard it from another point.

A copious suppuration has been observed to bring on marasmus, unless the loss were compensated by abundant nutrition. On this fact spoliative treatment is founded; but there is another fact, namely, that a suppuration, situated for example at the upper part of a limb, rapidly causes atrophy of the limb, probably because a part of the arterial supply is diverted from the limb to the suppurating spot. Two things are then to be considered; a local irritation which draws blood to a part, and spoliation of the elements of the blood—that is, transpositive and spoliative revulsion at once. These two forms are mingled, for in immediate transpositive revulsion the blood or its elements are strongly attracted toward the point of revulsion, and in the other the elements of blood are drawn and slowly poured out from the system. There is only this important difference, that in one case the intensity of the irritation is the leading phenomenon; in the other it is the abundance of spoliation. Hence spring naturally the rules which should direct us in the choice of revulsives. For the most acute and rapid diseases, take revulsives that act directly; for congestions, take mustard, caloric, urtication, flagellation, cupping. To recall eruptions to the skin use the same, but longer. For acute energetic phlegmasiæ, ammonia and cantharides. For chronic affections take antimonial ointment, the permanent blister, and especially the issue or seton. Atrophy of limbs caused by morbid or therapeutic suppurations upon them leads to the use of cauteries and setons not only for resolving chronic engorgements, but also to produce atrophy of the tissues in which excessive nutrition exists. Thus, issues and setons over the regions of the heart, the liver, the spleen, to modify the nutrition of these organs if hypertrophied.

When the transpositives are used, the duration of the symptoms they are directed against must be carefully estimated, to save the patient from needless pain and perhaps dangerous therapeutic effects. We will give, as an example, cholera. The indication for revulsives hardly exists in cholera except during the cold period; the life which seems about to fade away must be recalled to the skin at any rate, and the means of cutaneous stimulation cannot be too many. Whether the irritants act as gen-

eral excitants, or as transposing to the skin the internal fluxion which is supposed to attack the digestive organs, in either case, the indication for revulsives exists only in the cold stage; as soon as reaction begins, far from seeking to increase the points of inflammation, we must do our best to extinguish them where they appear. In irritating the skin during the first period, we are obliged to look for methods of sufficient energy, and yet of such a transitory nature that they leave no traces during the second period. Urtication and mustard do this admirably; if blisters with ammonia or cantharides could produce the same results at once, they would still compromise the patient's safety subsequently by the excess of fever they provoke. We have taken cholera as a type, but there are few diseases in which we do not sometimes have to do the same. At the onset of an acute disease, if the blood, which is so important in most affections, is only in the condition of congestion, a rubefacient is indicated; a topical agent which might cause a continued inflammation is to be feared, for it may become a source of prolonged and needless suffering, or perhaps of general excitation. The same rule should be observed when we have ground to suppose that we shall have to continue this treatment several days, for one may safely place ten sinapisms a day on a patient's body, bnt not that number of blisters or issues. In general, the revulsive irritatives should be limited in extent, in proportion as they are energetic.

Place for revulsion.—For this purpose we should choose a tissue in which the artificial malady will not be more severe or troublesome than the one we are combating. Experience points to the skin and mucous membrane as those which best endure irritations. The systematic statements of Broussais concerning the pathological and physiological supremacy of the stomach and intestines have only been accepted by those ignorant of experimental pathology and physiology. When we compare the structure and functions of these two membranes, we find that if a prompt irritation and a rapid and abundant secretory evacuation are required we must address the mucous membrane. Thus, in angina, in pulmonary catarrh, in certain superficial cutaneous affections which may safely be caused to disappear, an emetic or purgative will act with more benefit than any irritant applied to the skin; and this is readily understood when we think of the immense surface of mucous membrane and the abundance of the secretion which the contact of an irritant produces. If we require a transient and superficial irritation, to be renewed every day, the intestinal canal should always be preferred to the skin; thus, in chronic headaches, in frequently occurring congestions of the brain or lungs, in chronic ophthalmia, no revulsion takes the place of a daily purge. But if we require a deeper and more continued irritation, we must appeal to a membrane whose functions are not so essentially related to nutrition, namely, the skin. With the invasion of the physiological doctrine, revulsives to the intestinal canal were banished from therapeutics, and the skin alone had to bear the burden of all inflammations; but

within a certain number of years the purgatives have been properly resumed.

A suppurative inflammation may be situated in the skin for a lifetime without doing any harm to the system; it ought, therefore, to be selected for all very protracted revulsion. Besides, we may choose what portion of skin we will; whereas if we use the digestive tract, we must irritate the whole of it, unless we make rectal injections.

There is nothing exact in regard to the portions of skin or mucous membrane which we ought to prefer; but some general rules may be given, as follows.

Experience shows, though it may not be easy to explain the fact, that certain parts of the body are connected with other distant parts by functional ties which may properly be called sympathies. These are infinitely less in number than Broussais and other solidists pretend, but some such do exist. The womb and the breasts, which are physiologically connected, have also a pathological sympathy; whence the precept of Hippocrates, to apply cups to the breasts of women affected with metrorrhagia; and the general principle of soliciting blood to the uterus in women threatened with scirrhus or cancer of the mammary glands.

The suppression of certain fluxes, certain fluxions, or certain morbific accidents, as rheumatism, gout, etc., is a frequent cause of disease. The aim of the therapeutician should be to recall these, by revulsives, to their former places.

It is manifest that when an habitual epistaxis or a chronic coryza is succeeded by an obstinate headache or a laryngeal catarrh, the treatment must produce a new irritation in the mucous membrane of the nasal fossæ by the use of mercurial powders, hellebore, etc.; and if the discharge from piles is suppressed, and replaced by symptoms which seem caused by such suppression, the best revulsives will be antimonial suppositories and cups to the margin of the anus; and warm or sinapized foot-baths, cups to the thighs, and sitz-baths, to recall the menstrual flow, in case suppression causes alarming symptoms.

The suppression of one disease sometimes gives rise to another that is worse, as in the case of piles or coryza; we ought then to prefer the light affection to the severe, and to do everything to re-establish the former, but the patient often wishes to get rid of both. We have known a young woman troubled with leucorrhœa and engorgement of the womb for years; she wished to be cured; but as soon as the uterine flow disappeared, she was troubled with hæmoptysis and all the signs of incipient tubercle of the lungs. Fortunately, she had a miscarriage which brought back the uterine flow and the leucorrhœa; and all the morbid symptoms connected with the lungs soon ceased. She then applied to us to be cured of her leucorrhœa, but we positively refused to do anything until she allowed a large issue to be placed upon her arm. The issue was applied, the uterine affection was readily cured, and the trouble with the lungs did not return.

When the cure of a chronic phlegmasia gives rise to grave symptoms, we must either re-establish the former affection, or at least fill its place by topical agents which maintain at one point of the skin a permanent inflammation and an abundant suppuration; and here the blisters, issues and setons play the chief part.

As regards the most suitable place for applying revulsion, in given cases of disease, the practice is so contradictory and the observations are so few that we shall take the part of simple narrators, and refrain from an expression of opinion.

Some, for example, for irritant affections of the brain, direct mustard foot-baths and blisters to the legs; others apply cups, blisters, setons or moxas to the nucha to satisfy the same indication. Some, in acute or chronic thoracic inflammation, prefer revulsion by the walls of the chest; others prefer to irritate the skin of the arms and legs. Some, in engorgements of the liver, irritate the mucous membrane of the digestive tract as much as they can, and chiefly the lower part of the rectum; others proscribe these methods, and direct revulsives to the skin and cellular tissue of the right hypochondrium. Some make it an invariable rule to place the revulsive between the heart and the affected point, so as to intercept the circulation and draw off the blood or some of its elements before it reaches the inflamed tissue. It would be hard for us to say whether these rules are founded in reason; experience must be the judge in such cases. Usage, which perhaps is not the best rule, generally directs that in order to cure congestions, we should apply the excitant to a part which receives a different blood-supply from that which is distributed to the congested part. To solicit congestion of the uterus, which is supplied by a division of the iliac artery, we apply to the legs topical irritants capable of drawing to the capillary extremities of the femoral artery; which like the hypogastric is only a division of the iliac; while on the contrary, we use exactly the same means to avert congestion of the brain, which is supplied from the carotid and the subclavian. The mobility of the blood, when congestion only exists, renders this distant effect easy; but when a phlegmasia is commencing, or the inflammation is beginning to fail, the transpository irritants must be placed in contact with the skin near the affected region. It is the same with spoliative treatment, unless our object be to bring back a fluxion to a point whence it has disappeared; thus, when the healing of an ulcer on the legs is followed by a chronic phlegmasia of the thoracic organs, it is better not to put an issue or a seton in the walls of the chest, but to make an issue in the leg where the ulcer was, or to make the old sore suppurate with a permanent blister.

The seat of revulsion is most important to decide when we wish to produce atrophy of an organ, or at least to arrest the excess of nutrition, which may soon occasion functional trouble. Thus, when iodine fails to cure hypertrophic goître, the forming of an issue over the tumor is perhaps the simplest remedy, as in simple hypertrophy of the heart it is

useful to keep up large surfaces of the suppuration on the skin of the præcordial region.

One word more. Do all these facts, verified as they are by medical tradition, find an explanation in modern physiology? Must we admit, for instance, that reflex action gives a sufficient account of them? It is certain that some substances which do not change the coarse structure of tissues to which they are applied may produce in the deep-seated organs, by reflex action, important and perhaps even permanent modifications; but the case is quite different with revulsion.

In revulsion we produce at a point a more or less permanent lesion, and not a transitory effect, as when we wish for a reflex action; besides, in order that the reflex action may be active, it is necessary that the spinal cord be separated from the brain, etc. Yet we do not deny that in revulsion reflex actions occur; what we do deny is, that revulsion is accomplished simply through a reflex action.

We believe that the theory of revulsion is to be derived entirely from the application to biology of that great discovery of the unity of physical force, and of the equivalent transformations of its different modes; of which discovery, the determination of the mechanical equivalent of heat is but a fragment.

Man has only two sources from which to draw the force which he requires, food and respiration; he expends it in muscular labor, secretion, mental labor, etc. The difference between these two terms represents growth and excretion. In the total of expended force, the modes of expenditure vary with the nature of the life; one expends more in intellectual labor, another in mechanical toil, a nurse in lacteal secretion, etc.

It is very probably the same in pathology. In a given affection, one element will assume a leading importance, and the morbid labor may at a given moment undergo a total transformation into another equivalent form of labor. We consider this the true scientific formula of crisis of metastasis, and, in particular, of revulsion. We may perhaps say that revulsion or derivation consists in establishing upon an organ of minor importance an artificial action which is without danger to the system, to replace the morbid action; that is, to form its equivalent.

Choice of revulsives.—Experience gives us the law, that in order to produce a good revulsion, we must as far as possible establish an artificial pathological action of the same nature as that of the disease we wish to attack. To congestion we oppose rubefacients; to exudative phlegmasiæ, blisters and the irritants which produce exudation; to suppurations, revulsives which produce pustulation, and issues.

Spoliative Irritant Treatment.

Spoliation, in the therapeutical sense, occurs whenever one or more of the elements of the blood are withdrawn from it, in a greater propor-

tion than is due to the normal processes of organic composition and decomposition.

The abnormal secretions are merely exaggerations of the regular secretions of the economy, and spoliative treatment is applied solely through the excretions. The secretion of pus is doubtless more than an exaggerated normal secretion; but in any case, it is always one or more of the elements of the blood that are secreted.

Ptyalism, diarrhœa, bilious or mucous vomiting, the various catarrhs, diaphoresis, diuresis, are the agents of spoliation. We shall speak at a later time of evacuants, that is, agents which increase the secretion of the alimentary mucous membrane and its appendages; and of antiphlogistic treatment, in which spoliation by the direct evacuation of blood-vessels is the chief feature; of diuretics, sudorifics, etc. We shall here speak of only a portion of spoliative medicine, that which acts through suppuration.

Chemical analysis has demonstrated serum, albumin and fibrin in a new state of combination in the pus; from which it follows that suppuration necessarily draws from the system all the principles of the blood except one, the cruor.

Omitting for the moment the local and sympathetic irritation which necessarily accompany suppuration, we will study first the isolated fact of spoliation.

If most of the elements of the blood are used without profit to nutrition, daily and momentarily, the expenditure must be out of proportion to repair, and the organs will have a tendency to atrophy. This is what occurs after all abundant suppuration; and marasmus is the necessary consequence. The diminution of the blood in the vascular channels must, and always does produce this effect. Physiological experiments show that bloodletting singularly assists absorption; now a partial and continued bloodletting, like suppuration, produces the same result, but slowly and insensibly.

Resolution in phlegmasias is simply interstitial resorption in a special organ, as emaciation is interstitial resorption in all the tissues of the economy.

We will here give a brief attention to certain phenomena of secretion in inflamed organs.

In the first stage of inflammation there occurs an active flow of liquid to the part: after which, the interstitial secretion increases, and, in certain organs, attains an extraordinary abundance. This abundance is nowhere more considerable than in the large and small cellular cavities, as the serous sacs and the cellular tissue proper. In parenchyma which has a degree of resemblance to cellular tissue, as the lung, the morbid interstitial secretion is almost as great as in the cellular tissues proper.

While the cause of inflammatory fluxion—the irritation—persists, the fluxion itself is always in excess of absorption, and the swelling keeps increasing; but when irritation ceases, and the general harmony of the

forces is re-established, resorption occurs with a rapidity proportioned to the number and vascularity of the cavities in which it is contained, and the abundance of the secretion. Hunger is a most certain sign of the activity of interstitial resorption; when convalescents are hungry, absorption is going on with unusual intensity in the tissues which have just been the seat of phlegmasia.

It is at first hard to see why interstitial absorption goes on with prodigious activity in a lung which has lately been inflamed, while it is null or almost null in the healthy tissues, the muscles, liver, spleen, kidneys, etc. It is because the blood, when once converted into a framework or a parenchyma, lives a more energetic, complete, and individual life, and as a living body gains the power of resisting the absorbent action of the vessels; while fluids exuded in the cellular tissue possess but an incomplete organization, and have only the life of organic molecules; they have the faculty of becoming tissues—but as yet, no individual existence. They are therefore the first to be attacked by the interstitial digestive forces, as are the alimentary substances in the digestive tubes.

A constant suppuration at one point of the body, by causing a constant depletion of the sanguine system, continually starves the organs of absorption (if we may use the expression), and consequently favors the resolution of effused inflammatory products.

Whenever a chronic phlegmasia exists at any point of the body, and irritation has nearly or quite ceased, while the morbid effusions remain in the serous cavities, or in the parenchyma; or when the products are effused externally as in the case of the mucous membranes and the skin, it is the physician's duty to establish a point of suppuration, if he has not obtained a cure by the ordinary means.

Spoliation by exutories, however continuous, is not so active that it can balance the restitution made by a rich alimentation which furnishes more than the system needs. The patient, therefore, while spoliative treatment is continued, must be subjected to such a regimen that repair is below the requirements, in order that the exutory may not lose its activity. It does not follow that we must always restrict the diet where an exutory is applied. Dieting, or at least a somewhat severe regimen, is necessary so long as morbid products remain to be absorbed; but afterwards the severity of the regimen may be relaxed, as the exutory no longer needs to act by spoliation, but by other properties of which we will speak hereafter.

There is a very grave question in medicine, which has for centuries been considered as settled, and which is hardly discussed at present by pathologists; it is the question of the spoliation of certain degenerated humors by exutories. At the time when pathology was ruled by the idea of the humors, it was firmly believed that the exutory acted only by removing the peccant material from the blood; a depurative action. Such an opinion had the advantage of striking with a material fact; the vulgar, and the doctors too, who cannot always be distinguished from the

vulgar, were the more convinced of depuration, as they saw it proved by the senses. For more than sixty years the solidist doctrines have governed the medical art in their turn, and yet physicians hardly dare to brush against a popular view which is so profoundly rooted and so vigorous.

Certainly no one will suspect us of wishing to revive absurd humoral notions, or to wish to revive the question, whether the pus discharged by a seton existed before the match was applied; but there is an element of truth in the pretended depuration, which we will state.

To make ourselves clear, we will recall a fact which has certainly been noticed a thousand times by physicians, and to which Bretonneau was the first to call the attention of pathologists. A man may for years receive slight wounds with impunity, and even very deep wounds, without suppuration ever appearing; everything unites most readily by first intention. He has what may be called a healthy skin. But if by chance he receives an injury of such a nature that suppuration is a necessary consequence, he will subsequently, and perhaps for a great many years, suppurate on the slightest occasion, and will have what is called "a poisonous skin," that is, a skin which is poisoned very easily by wounds, even if slight. Furuncular eruptions, anthrax, phlegmasias of bad character, will be often observed in him, and frank inflammation, even of the internal organs, will pass into suppuration more readily than in other patients.

It is also observed that patients who wear an issue or a seton do not suffer from the troubles just named while the suppuration is kept up; but that the troubles appear at the moment the flow of pus is suspended, to disappear again when the exutory is re-established. Further, in persons thus disposed to suppuration, issues and setons give a much more abundant discharge of pus than in other persons.

Is it, then, absurd to claim that the blood contains, if not pus, at least elements which will turn to pus with deplorable readiness; and that the irritation caused by the pea of an issue, or the string of a seton, in calling an inflammatory fluxion to a given point, attracts towards that point the molecules of blood which have a tendency to become pus, and exhausts (if we may so speak) the purulent leaven of the blood? In this point of view an exutory is a real depurative agent, in the sense in which the physicians of old time understood it.

Let us pass by the explanation, and come to the practical result. If by the aid of an actively sustained exutory we put an end to the disposition to suppurate, we also lessen the chances of all diseases of a bad type, of those parenchymatous suppurations which are so destructive, and so ready to appear, in the condition of which we now speak. The exutories will in this case be ordered rather as a prophylactic than as a remedy.

On the other hand, if the suppression of an issue, a blister or a seton causes a general tendency to suppuration, we must be more cautious than is generally the case in ordering the suppression of the suppuration, or must take the precautions which our predecessors have so much insisted upon.

It is easy to see how grave a matter may be the suppression of an exutory which has been worn a long time. First, the system is accustomed, and with benefit, to the secretory servitude. The morbid secretion has become constitutional, and therefore cannot be suppressed without a great general perturbation; and besides, the system retains for a long time a tendency to suppurate which has its dangers in case a phlegmasia should occur.

From what we have said it does not follow that we regard exutories as indispensable in the treatment of all chronic phlegmasias, and after all suppurations, and that we never permit their suppression. We only wish to say that exutories must always be replaced by other spoliative agencies, at the head of which we put purgatives, sudorifics and diuretics. The long-repeated use of these is a powerful method of diversion, and if our predecessors have prescribed them to excess, they have been proscribed in our day with a rigor which is not justified by the former abuse.

The choice of an exutory is not indifferent. Our sole aim is to withdraw a portion of most of the principles of the blood. The local irritation, a necessary condition of suppuration, must be as slight as possible; of all methods, the issue is certainly the least painful; the seton comes next, which gives a little more pain, but by the abundance of its discharge causes a very abundant humoral evacuation. The seton may, therefore, be preferred as a remedy, and the issue as a prophylactic. We must use the seton in chronic visceral phlegmasias, in inflammations of the mucous lining of the great splanchnic cavities. As to blisters, the sharp pain which they almost always occasion, the difficulty of dressing them, and the inequality of the suppuration, ought to cause their disuse as general spoliative agents, though they form an heroic remedy to fulfil the other indications of irritant treatment.

We have passed over the local and sympathetic irritation provoked by an exutory, independently of spoliation; but this part must not be neglected. For there is a double, and sometimes a triple therapeutic action, to wit: a transpositive, an excitative, and a spoliative action. We have already stated our view of transpositive treatment; and shall next attempt to explain under what circumstances irritation of the skin becomes a cause of general excitation.

If we pass in review the spoliative agents, we shall find that the exutories are the least injurious of all. It is doubtless convenient to purge, to produce sweating or diuresis; but as these results are always obtained by an irritation applied to a large surface, or an active modification of the entire economy, the organs do not always get accustomed to this continuous perturbation, but may become fatigued or inflamed, or lose their irritability, and a too-dearly bought treatment has to be abandoned. Of small daily bleedings it is impossible to think seriously, though it has been advised by the exaggerated and rash partisans of the physiological doctrine.

But the application of an exutory, considered as a local irritation, is rarely dangerous, even in the slightest degree; except in persons so excitable that they could not endure any other spoliative remedy. Considered as a spoliative, the exutory, by the slowness and the continuity of its action, and the ease with which its effects can be measured and graduated, will always hold the first rank among the agents of spoliative treatment.

Excitative Treatment.

We have seen topical irritants applied to the human body for the purpose of substituting a therapeutical inflammation for one already existing, or in order to carry to a given point a phlegmasia existing in another place, or to solicit a continued flow of the elements of the blood and a kind of derivation.

We have said that these attempts are often mixed, and can never be obtained perfectly isolated. There is a fourth mode of action, which is hardly distinguished from the two preceding, but which, like them, acquires a special predominance under some circumstances.

The local irritants, as giving rise to an inflammation, produce the consequences of all inflammations, to wit, a local fever always, and sometimes a local and a general fever at once.

The reaction of the system against morbific agents, called fever, is a necessary and often useful incident of almost all acute diseases.

It may sometimes be beneficial to excite fever, and there will often be many advantages in preferring an irritant applied to the skin rather than an excitant which acts by absorption. We do not share the belief, which of late has prevailed too widely, that these excitants are dangerous, owing to the gastritis and the gastro-enteritis which they occasion. It would in truth be hard to find among the excitants any agent which might be considered as a topical irritant in prudent doses. These puerile fears do not stand in our way; but experience shows that the remedies which enter by absorption do not always have as simple a mode of action as those which appeal to the nervous system alone, doubtless because they are carried by the circulation to stimulate all the blood-containing organs, together with the nervous centres. The cutaneous irritants evidently act on the nervous system alone, and in this respect are closely allied to caloric. Thus, when the Brownian excitability seems extinct, and when, febrile reaction diminishing, the other symptoms become aggravated, we must employ sinapisms, flying blisters, and the various irritant applications almost exclusively.

We have, in speaking of cholera, remarked upon the harmfulness of exaggerating this excitation. It may be considered a rule, that if, from experience, we judge that excitation will be long required, blisters must be preferred. But when we require only a transient excitation, as in the cold period of cholera, in the period of concentration of pernicious inter-

mittents, the only remedies indicated are urtication, mustard poultices, the use of heat as a rubefacient, or, in brief, the energetic and transitory agents.

If these acted only as excitants, they would nevertheless find employment in a great variety of circumstances; but they possess in addition important revulsive and spoliative powers, whereby they fulfil a triple indication, which excitants given internally never could. These manifold powers are found also in topical irritants applied to a small surface, with the object of causing a local excitation. The latter can never be produced except by topical means, for it would be an inconvenient thing to arouse the whole system in order to reach a corner of the body, which we should probably rarely reach after all. A few words will explain it.

The fact of inflammation in a region excites a fluxion of blood and an effusion of morbid products into the meshes of the tissue, or upon the surface of membranes. When the inflammation has lasted some time, the local incitability becomes lessened, and the interstitial energy necessary to the digestion and assimilation of morbid products is no longer adequate to such result. In the same way, in a stomach weakened by too exciting a diet, the food cannot be digested unless the excitation be increased; and likewise, in a tissue whose incitability has been used up by excess of irritation, the effused morbid products will not be absorbed unless we stimulate the vital properties of the part. This explains the success of blisters, of issues, of the objective cautery, of the moxa, in indolent tumors; an explanation which would not be completely satisfactory if we did not attend to the transpositive and spoliative actions which occur at the same time.

In this, as in all treatment, excess should be avoided; for, if it be necessary to excite the vital properties, the stimulation must not be pushed so far as to cause too energetic an inflammation; not that this may not sometimes be useful, as a substitutive; but in general the action of the local remedies must be graduated so as to solicit at most a slight inflammation which is directly relieved by antiphlogistics.

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